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U S ARMY
MATERIEL DEVELOPMENT AND READINESS COMMAND

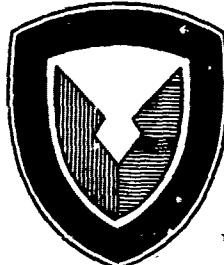
LEVEL IV
B.S.

12

PROGRAM ACCOMPLISHMENTS

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MANUFACTURING
METHODS
&
TECHNOLOGY



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PREPARED BY

OCT 80

MANUFACTURING TECHNOLOGY DIVISION
U S ARMY INDUSTRIAL BASE ENGINEERING ACTIVITY
ROCK ISLAND, ILLINOIS 61299

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DEPARTMENT OF THE ARMY
US ARMY INDUSTRIAL BASE ENGINEERING ACTIVITY
ROCK ISLAND, ILLINOIS 61299

SUBJECT: MM&T Program Accomplishments

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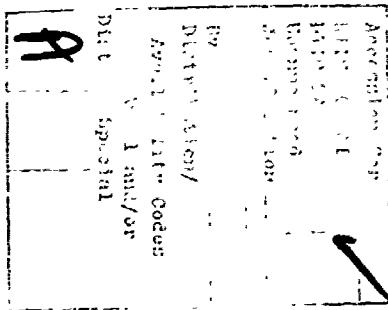
1. Reference AR 700-90, Cl, Para 3-8e(2), Logistics, Army Industrial Preparedness Program, dated 10 March 1977.
2. This brochure illustrates some of DARCOM's MM&T Program Accomplishments. It presents the achievements by Major Subordinate Commands with emphasis on illustration of the types of projects pursued. The format of this brochure has been somewhat modified for this issue in accordance with the increased emphasis on implementation. Projects that have anticipated benefits and implemented efforts with actual benefits have been placed in separate sections to provide a clear distinction between them. A summary has been provided as the first section of the document to provide an overview.
3. Further information on the projects illustrated in this brochure should be obtained from the MM&T representatives, project officers shown, or from Mr. James Carstens, Chief, Manufacturing Technology Division, AV 793-5113.

J. R. Gallagher
J. R. GALLAUGHER
Director
Industrial Base Engineering Activity

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INTRODUCTION

The Army Manufacturing Methods and Technology (MMT) Program was begun in 1964. The purpose of the program is to develop new manufacturing processes that can be applied to the production of Army items. Over the years hundreds of these projects have been funded and used to develop new technology. This brochure records the results of some of those projects.

Much literature has been written concerning the transfer of technology from the "laboratory" to actual production. It is often difficult to make this transition; however, the full benefits of new technology can be obtained only if this transition has been made. The Army is placing more emphasis on technology transfer to attain greater project benefits. This brochure is widely distributed throughout the Army in order to publicize the results and disseminate knowledge to potential users. Other methods of accomplishing this transfer are through end of project demonstrations; preparation of technical reports, project summary reports, and technical notes; and, through inclusion of technology information in bulletins and journals. All of these techniques, however, serve only to disseminate the information. Real benefits can only accrue once the new technology is implemented.

MMT POINTS OF CONTACT

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MMT POINTS OF CONTACT

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	Mr. Joseph Tagliarino US Army Munitions Production Base Modernization Agency Attn: SARPM-PBM Dover, NJ 07801	AV 880 6708 (201) 328 6708
6	Mr. August Zahatko US Armament Materiel Readiness Command Attn: DRSAR-IRB Rock Island Arsenal Rock Island, IL 61299	AV 793 4485/3730 (309) 794 4485/3730
7 or E	Mr. Sydney Newman US Army Mobility Equipment R&D Command Attn: DRDME-UPE Ft. Belvoir, VA 22060	AV 354 5530 (703) 664 5530
0	Mr. Grover Shelton US Army Test & Evaluation Command Attn: DRSTE-AD-M Aberdeen Proving Ground, MD 21005	AV 283 3677 (301) 278 3677

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SECTION I

SUMMARY OF BENEFITS

ACCOMPLISHMENTS SUMMARY

PROJECT NUMBER	ANTICIPATED BENEFITS \$ SAVINGS OTHER		ACTUAL BENEFITS \$ SAVINGS OTHER	REMARKS
7 72 3501	INCREASED CAPABILITY			AVAILABLE FOR IMPLEMENTATION
7 74 3567	REDUCED TEST TIME			TWO PROTOTYPE SIMULATORS WERE BUILT
2 76 9773	\$2 MILLION			SOFTWARE IS AVAILABLE FOR IMPLEMENTATION
2 74 9523	\$175/UNIT	INCREASED LIFE & PERFORMANCE		
2 75 9525		REDUCED LABOR & INCREASED PROCESS YIELD		A PRODUCTION RATE OF 200/MONTH WAS ACHIEVED
H 75 9665	\$ 10,000/YEAR			LASER TRIMMING FOR FINAL TUNING
2 75 9738	\$1.7 MILLION			IMPROVED PROCESSING
2 73 9744		REDUCED DESIGN VERIFICATION TIME		AVAILABLE FOR IMPLEMENTATION
4 75 4561		REDUCED DIE DESIGN TIME		INTERACTIVE COMPUTER ASSIST
T 77 4589		ASSURES INTEGRITY OF DESIGNS		COMMAND CONVERSION PLAN WILL IMPLEMENT
4 77 5019	\$3.0 MILLION	LOWER MAINTENANCE		FOLLOW-ON PROJECT IS COMPLETING THIS EFFORT
1 76 7055	\$225,000	LIGHTER & LESS EXPENSIVE UNIT		FOLLOW-ON PROJECT IS COMPLETING THIS EFFORT
1 72 8036	NONE			UNDESIRABLE SIDE EFFECTS
1 74 8091		80% REDUCTION IN PROCESSING COSTS		
1 74,75,76 8109	\$14 MILLION	MORE ENVIRONMENTALLY TOLERANT UNIT		
3 76 3147	\$4.7 MILLION	REDUCES UNDESIRABLE CHEMICAL DISCHARGES		FOLLOW-ON PROJECT IS COMPLETING THIS EFFORT
R 77 3168	\$10 MILLION	INCREASED PERFORMANCE		PRODUCTION RATE OF 50/HOUR ACHIEVED
3 76 3224	\$1.5 MILLION	REDUCED FIELD FAILURES		ADDITIONAL EFFORT IS PROPOSED
3 76 3225	\$760,000/YEAR			FOLLOW-ON EFFORTS ARE REQUIRED
3 76,77 3228		ELIMINATES BATCH OPERATIONS		FOLLOW-ON PROJECT IS COMPLETING THIS EFFORT

ACCOMPLISHMENTS SUMMARY (CONT)

PROJECT NUMBER	ANTICIPATED BENEFITS		ACTUAL BENEFITS	REMARKS
	\$ SAVINGS	OTHER		
5 73 1139		REDUCED EXPLOSIVE HAZARD		TWO MACHINES WERE FITTED WITH FLUIDIC CONTROLS
5 73,75 1248		SAFETY ENHANCEMENT		AIR VENTILATION SYSTEMS DESIGN CRITERIA
5 74 1261		INCREASED CAPABILITY		PROTOTYPE SYSTEMS ARE IN USE
5 7T,77 1337		PROVIDED PRODUCTION CAPABILITY		PILOT PLANT WAS CONSTRUCTED
5 74 3049 & 3 76 3141	\$200,000/YEAR			LAMINATED FLUIDIC DEVICE
5 73 3051	\$250,000/YEAR	INCREASED TESTING CAPABILITY		
5 71,74 4041		AUTOMATED LINE		FOLLOW-ON PROJECTS ARE COMPLETING THIS EFFORT
5 73,74,77,78 4139	\$2.9 MILLION/YR	INCREASED CAPABILITY		FOLLOW-ON PROJECTS ARE ENHANCING CAPABILITIES
5 74 4162	\$1.29 MILLION/YR			CONTINUOUS AUTOMATED PROCESSING
5 71,72 4171	\$2.0 MILLION/YEAR			MINI PILOT PLANT WAS CONSTRUCTED
5 72,73 4220		INCREASED PRODUCTION CAPABILITY		AUTOMATED BATCH EQUIPMENT WAS CONSTRUCTED
5 74 4255		INCREASED PRODUCTION & TEST CAPABILITY		INSUFFICIENT PRODUCTION REQUIREMENTS
5 76,77 4280		AUTOMATED FINAL ASSY & CALIBRATION		MACHINES ARE BEING INTEGRATED INTO PRODUCTION
5 7T 4288		SAFETY STANDARDS		WILL BE INCORPORATED INTO SAFETY REGULATIONS
5 76 4288		SAFETY STANDARDS		WILL BE INCORPORATED INTO SAFETY REGULATIONS
5 77 4288		SAFETY STANDARDS		WILL BE INCORPORATED INTO SAFETY REGULATIONS
5 76 4291		EXPLOSION RESISTANT STRUCTURES		WILL BE INCORPORATED INTO SAFETY REGULATIONS
5 77 4341	\$1.2 MILLION/YR			CONTINUOUS PURIFICATION PROCESS
5 77 4416	\$1.6 MILLION/YR			SIMPLER AND LESS EXPENSIVE FABRICATION

ACCOMPLISHMENTS SUMMARY (CONT)

PROJECT NUMBER	ANTICIPATED BENEFITS \$ SAVINGS OTHER	ACTUAL BENEFITS \$ SAVINGS OTHER	REMARKS
5 7T 4457	\$1.5 MILLION/YEAR		INCREASED THE CAPABILITY OF EXISTING HARDWARE
5 72 6335	IMPROVED MATERIAL PROPERTIES		COMMERCIAL EFFORTS ARE IMPLEMENTING
5 71 6388	PURCHASE DESCRIPTION		ADDITIONAL EFFORTS ARE NEEDED
5 73 6550	REDUCED PERSONNEL & ELECTRICAL POWER REQUIREMENTS		
6 72,73 6681	LIGHTER CANNON TUBE		NO REQUIREMENT
6 72 6786	\$450,000/100K BBLS REDUCED OPERATOR REQUIREMENTS		INSUFFICIENT PRODUCTION REQUIREMENTS
6 72 6838	IMPROVED PROPERTIES & DECREASED COST		IMPLEMENTATION WILL BE UNDER PROJECTS 6 XX 7419
6 73 7056	DOUBLED THE OPERATIONAL LIFE		UNIT IS NOW A REPAIRABLE ITEM
6 73 7124	IMPROVED & MORE CONSISTENT PROPERTIES		PROCESS SPECIFICATIONS ARE AVAILABLE
6 72 7220	REDUCED TAPE PREPARATION COSTS		USED PRIMARILY FOR PROTOTYPING
6 72 7226	INCREASED MEASURING CAPABILITY		LASER OPTICAL SYSTEM
6 76 7236	\$57/TUBE	REDUCED FURNACE TIME FROM 70 TO 20 HOURS	
6 73 7242		\$110,000/YEAR PARTIAL IMPLEMENTATION	ADDITIONAL IMPLEMENTATION IN PROCESS
6 73 7261	LOW COST MIRRORS		INSUFFICIENT REQUIREMENTS
6 73 7265		\$19,000	FACILITY CLOSURE TERMINATED IMPLEMENTATION
6 74 7411	INCREASE PERFORMANCE UNIFORMITY		PROCESS DATA IS AVAILABLE
6 74,75 7419	\$85,000/YEAR		INSUFFICIENT REQUIREMENTS
6 74 7495	PROCESS INFORMATION		END ITEM NO LONGER IN PRODUCTION
6 74 7524	7% SAVINGS IN LABOR & TOOL COST		BORIDE COATED TOOLS
6 74,75 7550	\$500/TUBE		NO REQUIREMENT
6 75 7571	50% REDUCTION IN REQUIRED TESTS		SHOCK TEST METHODS & SPECIFICATIONS
6 75 7572	50% REDUCTION IN PRODUCTION TESTS		DETAILED ENG. SPECIFICATIONS

IMPLEMENTATION SUMMARY

PROJECT NUMBER	ANTICIPATED BENEFITS \$ SAVINGS OTHER	ACTUAL BENEFITS \$ SAVINGS OTHER	REMARKS
7 7X 3524		\$13.28 MILLION/YR	EQUIPMENT AT USE IN TWO FACILITIES
2 74 9744		PROVIDED PRODUCTION CAPABILITY	REPLACED HAND PRODUCED ITEMS
2 74 9750	\$3.2 MILLION		EQUIPMENT UPGRADING
2 75 9836	\$2.45 MILLION	PRODUCT QUALITY IMPROVEMENT	QUALITY ASSURANCE POLICIES AND PROCEDURES
T 7X 4329		NEW PRODUCTION CAPABILITY	JOINING OF DIFFERENT TYPES & HARDNESSES OF ARMOR
1 XX 7103		\$60 MILLION PROVIDED PRODUCTION CAPABILITY	TURBINE ENGINE MACHINING
1 77 7112		IMPROVED PERFORMANCE	KAMAN AEROSPACE CORP IS IMPLEMENTING
1 7X 8046		\$2.0 MILLION/YR REDUCED CRITICAL MATL USAGE	IMPLEMENTED AT GE
1 75 8154		\$10,000/YR (AIR FORCE APPLICATION)	INTERACTIVE COMPUTER SYSTEM
3 75 3157	\$10.24 MILLION	REDUCED WT & INCR RELIABILITY	HIGH RATE PRODUCTION CAPABILITY
R 7X 3170		PROVIDED PRODUCTION CAPABILITY	IMPLEMENTED AT LONGHORN
3 7X 3232		39% REDUCTION IN PROCESS PLANNING	COMPUTERIZED PROCESS PLANNING
5 7X 1248		REDUCED EMISSIONS	INSTALLED AT SEVERAL LOCATIONS
5 7X 1260		IMPROVED SAFETY	IMPLEMENTATION AT PINE BLUFF ARSENAL
5 7X 1277		IMPROVED SAFETY	IMPLEMENTED AT TOOELE ARMY DEPOT
5 7X 4032		TWO MILLION FUZES PRODUCED	IMPLEMENTED AT HONEYWELL FOR THE M739
S XX 4114-P06		REDUCES POLLUTANTS	INSTALLED AT RADFORD, OTHERS PLANNED
5 74 4205		PROCESS IMPROVEMENT	IMPLEMENTED AT HOLSTON
5 73 6522		INCREASED YIELD & REDUCED OPERATOR REQUIREMENTS	SEVERAL APPLICATIONS
6 7X 7248	\$176,000/YEAR	INCREASED EFFICIENCY	IMPLEMENTED AT WATERVILLET ARSENAL
6 73 7305		\$21,000/YEAR	IMPLEMENTED AT ROCK ISLAND ARSENAL

IMPLEMENTATION SUMMARY (CONT)

PROJECT NUMBER	ANTICIPATED BENEFITS		ACTUAL BENEFITS		REMARKS
	\$ SAVINGS	OTHER	\$ SAVINGS	OTHER	
6 74 7481			\$1.3 MILLION		IMPLEMENTED AT WATERVLIET ARSENAL
6 74 7484				FASTER & LESS EXPENSIVE N/C TAPE VERIFICATION	

SECTION II
RECENTLY COMPLETED OR ACTIVE PROJECTS

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

RESIDUAL STRESS MEASUREMENT

PROJECT NO: 772 3501

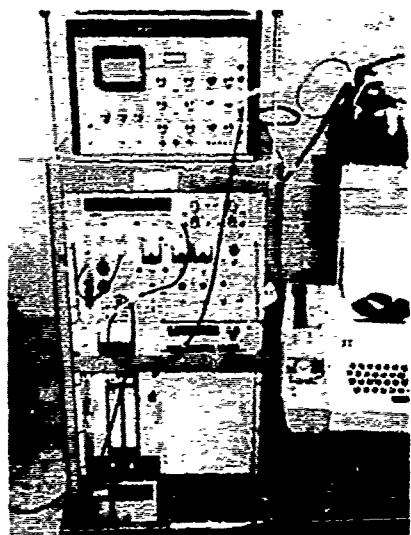
TITLE: DEVELOP TECHNOLOGY TO NON-DESTRUCTIVELY MEASURE RESIDUAL STRESSES IN LARGE COMPLEX STEEL WELDMENTS VIA THE MOSS BAUER EFFECT.

COST: \$161,000

RESULTS

RESIDUAL STRESS MEASURING EQUIPMENT FOR USE IN TESTING RIBBON BRIDGE COMPONENTS WAS FABRICATED. A PRECISION LEVEL OF ± 5 KSI WAS ACHIEVED WHICH IS ACCEPTABLE AND EXCEEDS THE CAPABILITIES OF OTHER TECHNIQUES.

THE EQUIPMENT DESIGN IS AVAILABLE FOR APPLICATION.



STRESS ANALYZER EQUIPMENT..

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT MINE DETECTOR TEST SET

PROJECT NO: 7 74 3567

**TITLE: TEST EQUIPMENT, AN/PRS-7
MINE DETECTOR**

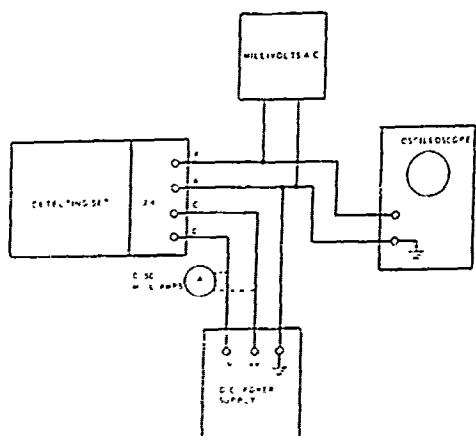
COST: \$180,000

RESULTS

**TWO PROTOTYPE TEST SIMULATORS
WERE DESIGNED AND FABRICATED. A
CYLINDRICAL SECTION CONTAINS THE
TARGET AND INCORPORATES CONTROLS
FOR PRECISE ADJUSTMENT OF THE TARGET
POSITION RELATIVE TO THE MINE
DETECTOR UNDER TEST.**

**USE OF THIS EQUIPMENT PROVIDES
ACCURATE AND REPRODUCIBLE TESTING.
IMPLEMENTATION OF THIS METHODOLOGY
IS ESTIMATED TO REDUCE TEST TIME
FROM ONE HOUR TO 20 MINUTES.**

TEST SET SCHEMATIC



DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT AUTOMATED TEST EQUIPMENT

PROJECT NO: 2 76 9773

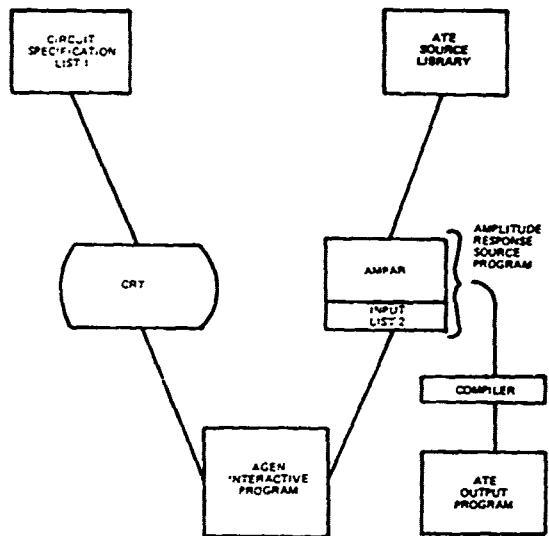
**TITLE: MMT COMPUTER PROGRAM AID
FOR PREPARATION OF AUTOMATIC
ANALOG CIRCUIT PRODUCTION
TEST PROGRAM**

COST: \$193,313

RESULTS

**AN OVERALL SOFTWARE SYSTEM WAS
DESIGNED FOR AUTOMATICALLY
GENERATING TEST PROGRAMS FOR
LINEAR ANALOG CIRCUITS. THE
SOFTWARE WAS PROVEN BY GENERATING
PROGRAMS FOR TWELVE CIRCUIT
CHARACTERISTICS AND DEMONSTRATED
ON THE AUTOMATIC TEST EQUIPMENT.**

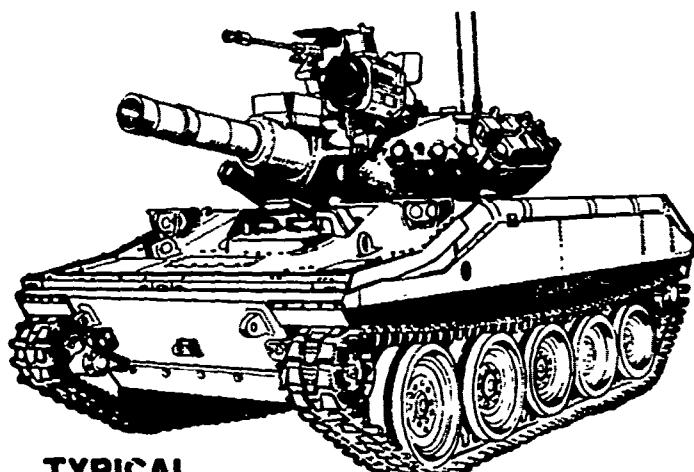
ESTIMATED SAVINGS UPON IMPLIMENTATION OF THIS PROJECT ARE \$2 MILLION.



DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT INFRARED FILTERS



**INFRARED FILTER
FOR AN/VSS 3A
SEARCHLIGHT**



**TYPICAL
SEARCHLIGHT/
INSTALLATION**

PROJECT NO: 274 9523

**TITLE: MANUFACTURING METHODS
FOR THE PRODUCTION OF
INFRARED FILTERS**

COST: \$43,552

RESULTS

**THE CONTRACTOR, METAVAC,
DEVELOPED A MANUFACTURING
PROCESS THAT SUBSTANTIALLY
REDUCED THE NUMBER OF PINHOLES
IN THE FILTER COATING FOR
SEARCHLIGHTS. REDUCTION IN PIN-
HOLES REDUCES THE CHANCE OF
DETECTION BY THE ENEMY.**

**PRODUCTION YIELD WAS INCREASED
CONSIDERABLY AND FILTER LIFE
WAS INCREASED FROM 300 TO
800 HOURS.**

**UNIT PRICE WAS REDUCED FROM
\$400 TO \$225.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT PIEZOELECTRIC TRANSFORMERS

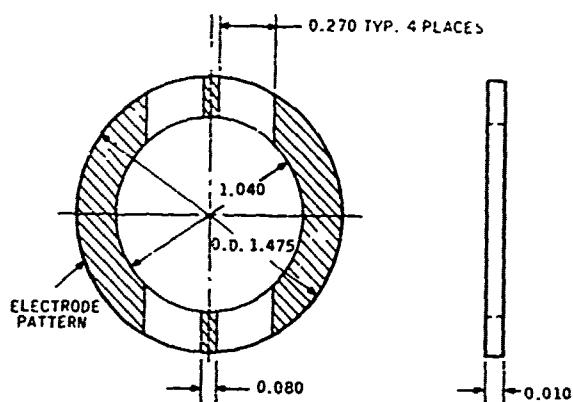


Figure 1 - 18MM ELEMENT

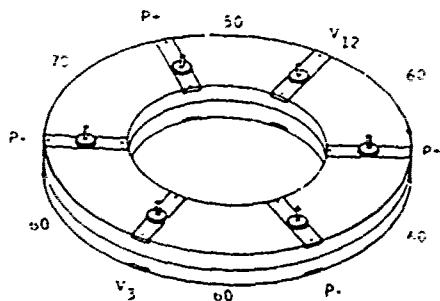


Figure 2
18MM PACKAGE CASE

PROJECT NO: 275 9525

TITLE: HOT PRESSING OF PIEZOELECTRIC ELEMENTS FOR HIGH VOLTAGE TRANSFORMERS

COST: \$229,000

RESULTS

- HONEYWELL INC. ESTABLISHED IMPROVED PRODUCTION TECHNIQUES FOR PIEZOELECTRIC TRANSFORMERS (PET) USED IN OPERATING 18MM NIGHT VISION IMAGE INTENSIFIER TUBES.
- A DOUBLE ACTION HOT PRESS DIE PRODUCED SLUGS THREE TIMES THE INITIAL LENGTH, REDUCED HOT PRESSING LABOR BY 60 PERCENT AND INCREASED SLICED ELEMENT YIELD FROM 90 PERCENT TO 96 PERCENT.
- SEMIAUTOMATIC SILK SCREENING OF DISK ELECTRODES, SEMIAUTOMATIC DISK POLARIZATION AND INJECTION MOLDING OF DISK PACKAGE WERE OPTIMIZED.
- A PRODUCTION LINE RATE OF 200 PER MONTH WAS ACHIEVED.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT AUTOMATED TESTING

PROJECT NO. H 75 9665

**TITLE: MANUFACTURING METHODS
FOR THE PRODUCTION OF
ELECTRONIC COMPONENTS
UNDER DYNAMIC STRESS**

COST: \$735K

RESULTS

THIS PROJECT DEVELOPED A PROCESS FOR LASER TRIMMING OF COMPONENTS FOR FINAL TUNING OF FUZES.

LASER TRIMMING IS PRESENTLY BEING USED ON THE THICK FILM RATIO METER IN THE M732 AND ON THE AMPLIFIER SECTION OF THE M734.

ESTIMATED YEARLY SAVINGS AS A RESULT OF IMPLEMENTATION OF THIS PROJECT ARE \$700,000 PER YEAR.

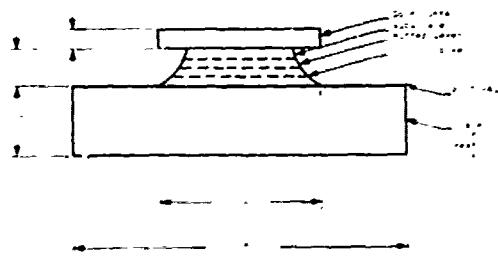


DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT GALLIUM ARSENIDE (Ga As) IMPATT DIODES

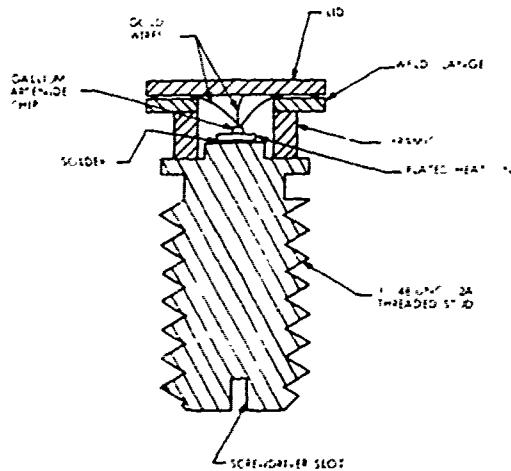
PROJECT NO: 275 9738

**TITLE: EPITAXIAL AND METALLIZATION
PROCESS FOR Ga As READ IMPATT
DIODE.**

COST: \$503,000



READ IMPATT CHIP



PLATED HEAT SINK DESIGN

RESULTS

**READ WAFERS WERE PRODUCED BY
EPITAXIAL DEPOSITION OF SUITABLY
DOPED Ga As LAYERS ON A HIGHLY
CONDUCTIVE SINGLE CRYSTAL
Ga As SUBSTRATE.**

**THE SCHOTTKY METALLIZATION BARRIER
WAS CREATED BY SEQUENTIALLY
SPUTTERING PLATINUM, TITANIUM,
AND GOLD.**

**IMPLEMENTATION OF THIS PROJECT WILL
RESULT IN AN ESTIMATED SAVINGS OF
\$1.7 MILLION.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT COMPUTER AIDED ELECTRONICS DESIGN

PROJECT NO: 273 S741

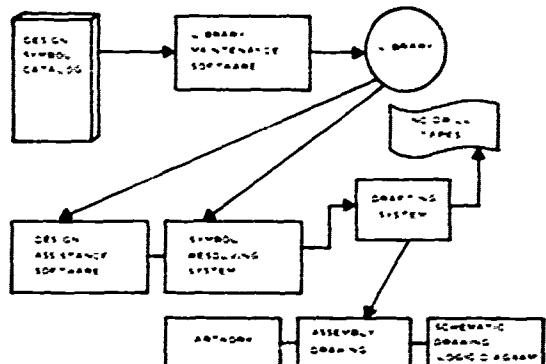
**TITLE: MMT ENGINEERING MEASURE FOR
CAD/CAM SYSTEM: DRAWING
SYMBOL LIBRARY**

COST: \$167,794

RESULTS

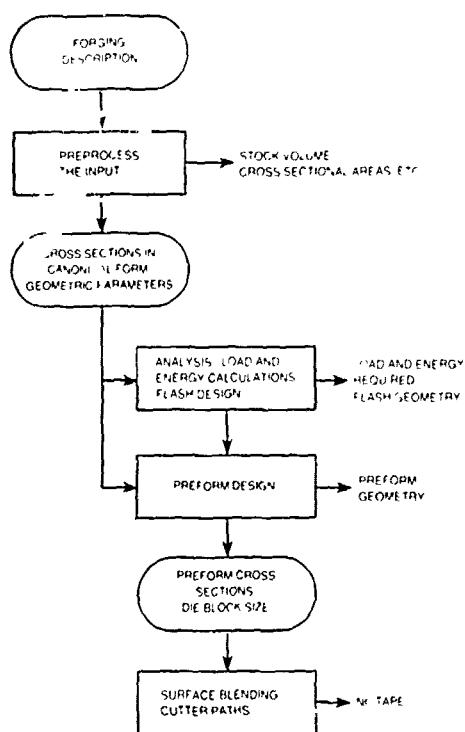
**THIS SOFTWARE WAS DEVELOPED FOR
DESIGN VERIFICATION OF AN INTEGRATED
PRINTED CIRCUIT SYSTEM AND VALIDA-
TION OF MASTER PLATES FOR SEVERAL
PRINTED CIRCUIT BOARDS. THE SYSTEM
WAS DESIGNED AS A LOW COST ALTER-
NATE TO A STAND-ALONE CAD/CAM
SYSTEM.**

**THE SOFTWARE IS AVAILABLE FOR USE
IN A DESIGN SYMBOL LIBRARY.**



DRAWING SYMBOL LIBRARY

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT COMPUTER AIDED DIE DESIGN



PROCEDURAL OUTLINE OF THE TRACK SYSTEM

PROJECT NO: 4 75 4561

TITLE: COMPUTER AIDED DIE DESIGN
AND COMPUTER AIDED MANUFACTURING FOR FORGING
OF TRACK SHOES AND LINKS

COST: \$135,000

RESULTS

A COMPUTERIZED SYSTEM FOR
DESIGNING AND MANUFACTURING
TRACK SHOE DIES. THIS SYSTEM,
KNOWN AS "TRACKS," IS A TOTALLY
INTERACTIVE SYSTEM TO ASSIST
DIE DESIGNERS.

THE SYSTEM CALCULATES GEOMETRIC
PROPERTIES, PERFORMS STRESS
CALCULATIONS, AND PREPARES AN
NC TAPE FOR MACHINING A MODEL
OR EDM ELECTRODE. IMPLEMENTATION
OF THIS PROJECT WILL
SPEED UP THE DIE MANUFACTURING
PROCESS AND ENSURE
REPRODUCIBILITY.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT METRICATION

PROJECT NO: T77 4589

STANDARD INTERNATIONAL (SI) UNITS

<u>QUANTITY</u>	<u>UNIT</u>
ACCELERATION	METRE PER SECOND SQUARED
AREA	SQUARE METRE
DENSITY, MASS	KILOGRAM PER CUBIC METRE
ELECTRIC FIELD STRENGTH	VOLT PER METRE
LUMINANCE	CANDELA PER SQUARE METRE
MOLAR ENERGY	JOULE PER MOLE
MOMENT OF FORCE	NEWTON METRE
RADIANCE	WATT PER SQUARE METRE STERADIAN
SPECIFIC HEAT CAPACITY	JOULE PER KILOGRAM KELVIN
SPECIFIC ENERGY	JOULE PER KILOGRAM
SPECIFIC VOLUME	CUBIC METRE PER KILOGRAM
THERMAL CONDUCTIVITY	WATT PER METRE KELVIN
VELOCITY	METRE PER SECOND
VOLUME	CUBIC METRE

TITLE: METRICATION

COST: \$271,000

RESULTS

THIS PROJECT PREPARED PRODUCTION AND PROCUREMENT PLANS TO ASSURE INTEGRITY OF COMPONENTS AND VEHICLE HARDWARE SYSTEMS UNDER INTERNATIONAL METRIC STANDARDS.

A METRICATION ENGINEERING/DESIGN GUIDE MANUAL AND AN EXPERIMENTAL FABRICATION CONVERSION PLAN WAS PUBLISHED. THIS PROJECT WILL BE IMPLEMENTED AS PART OF THE TOTAL COMMAND CONVERSION PLAN.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT LOW MAINTENANCE BATTERY

PROJECT NO: 477 5019

**TITLE: STORAGE BATTERY,
MAINTENANCE FREE (DRY-CHARGED,
CALCIUM ALLOY GRID, PLASTIC
CONTAINER)**

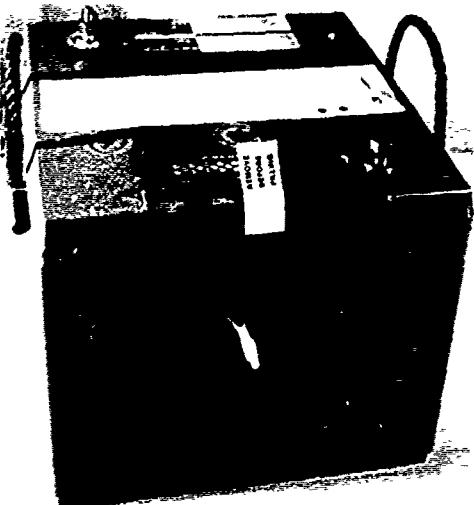
COST: \$139,000

RESULTS

**A CALCIUM ALLOY GRID BATTERY WAS
DEVELOPED AS A LOW MAINTENANCE
REPLACEMENT FOR THE STANDARD
LEAD-ANTIMONY GRID BATTERY.**

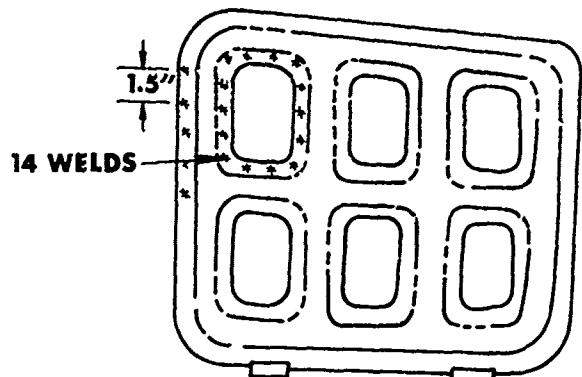
**THE BATTERY PROVIDED SOME OF THE
FEATURES NECESSARY TO MEET MIL
REQUIREMENTS AND A FOLLOW-ON
PROJECT WILL COMPLETE THE EFFORT.**

**COMPLETION AND IMPLEMENTATION OF
THIS EFFORT WILL RESULT IN AN
ESTIMATED \$3.0 MILLION SAVINGS.**



STORAGE BATTERY

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT ULTRASONIC WELDING



**ELECTRONIC ACCESS DOOR
ULTRASONIC WELD SPACING**

PROJECT NO: 176 7055

**TITLE: ULTRASONIC WELDING OF
HELICOPTER SECONDARY
FUSELAGE STRUCTURE**

COST: \$180,000

RESULTS

- TENSILE SHEAR STRENGTH OF SAMPLE ULTRASONIC SPOT WELDS WERE 2.5 TIMES THOSE OF RESISTANCE SPOT WELDS AND ABOUT 4 TIMES THE MINIMUM AVERAGE REQUIRED.
- FOUR PORT SIDE ELECTRONICS ACCESS DOORS WERE ULTRASONICALLY WELDED RESULTING IN A LIGHTER AND LESS EXPENSIVE UNIT.
- IMPLEMENTATION OF THIS PROJECT WILL RESULT IN AN ESTIMATED SAVINGS OF \$225,000.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT CONTROLLED GRAIN TURBINE BLADES

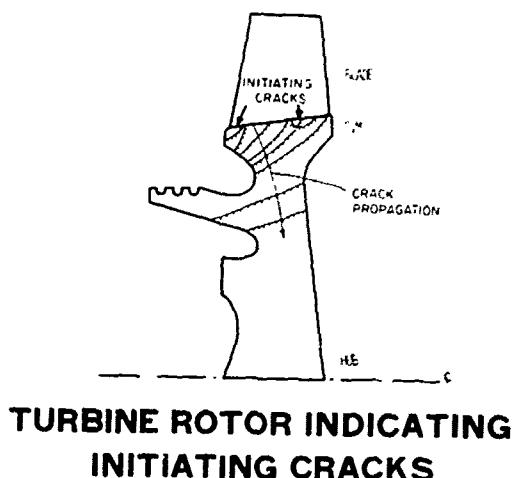
PROJECT NO: 172 8036

**TITLE: PROCESS FOR CONTROLLED
GRAIN SIZE IN THIN WALLED
TURBINE BLADES**

COST: \$185,000

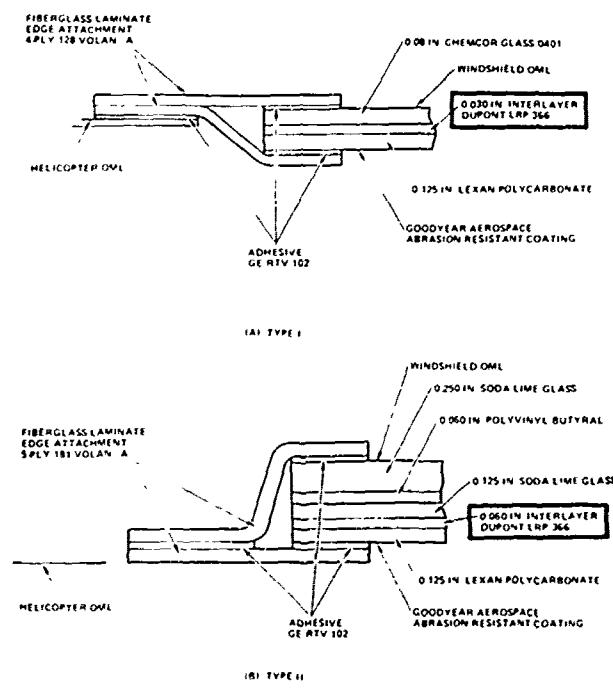
RESULTS

**CHANGES WERE MADE IN THE CASTING
PROCESS FOR TURBINE ROTORS IN
ORDER TO ALTER THE GRAIN REFINEMENT.
THE GRAIN REFINED ROTORS SHOWED
SUPERIOR FATIGUE PROPERTIES AND
RETAINED ADEQUATE STRESS
PROPERTIES; HOWEVER, THE YIELD AND
CREEP STRENGTH WERE DEGRADED
AND PROCESSING TIME WAS INCREASED.**



**TURBINE ROTOR INDICATING
INITIATING CRACKS**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT IMPROVED PERFORMANCE WINDSHIELD



PROJECT NO: 174 8091

TITLE: ADVANCED ADHESIVES FOR
TRANSPARENT ARMOR
FOR ARMY AIRCRAFT

COST: \$202,000

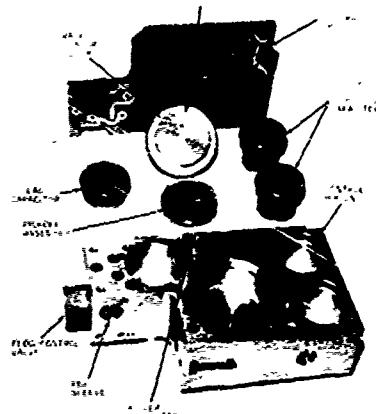
RESULTS

THIS PROJECT DEVELOPED A METHOD OF PRODUCING TRANSPARENT ARMOR USING FILM ADHESIVES RATHER THAN THE CURRENTLY USED CAST-IN-PLACE ADHESIVES. THE LRP-366 INTERLAYER PROVIDED LIGHT TRANSMISSION THAT WAS WELL WITHIN THE REQUIREMENTS FOR GLASS/PLASTIC COMPOSITES.

IMPLEMENTATION OF THIS TECHNIQUE WILL RESULT IN AN ESTIMATED 80% REDUCTION IN THE PROCESSING COST OF TRANSPARENT ARMOR.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

FLUIDIC DEVICE



FLUIDIC YAW CONTROLLER

PROJECT NO: 174 8109, 175 8109 & 176 8109

**TITLE: FLUIDIC DEVICES FOR AIRCRAFT
STABILITY AUGMENTATION
SYSTEM**

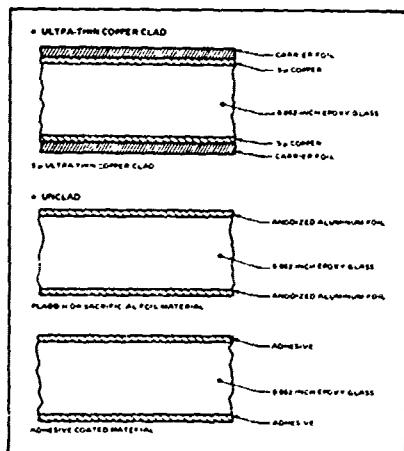
COST: \$574,000

RESULTS

- YAW CONTROLLERS WERE SUCCESSFULLY PRODUCED USING THE ELECTROFORM CONDUCTIVE WAX (ECW) PROCESS IN CONJUNCTION WITH CONVENTIONAL PROCESSING.
- A PILOT PRODUCTION LINE USING THE ECW PROCESS WAS DEFINED.
- PRODUCTION YIELDS OF 95% SHOULD BE POSSIBLE IN LARGE QUANTITIES.
- IMPLEMENTATION OF THIS PROJECT WILL RESULT IN AN ESTIMATED COST SAVINGS OF \$14 MILLION.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT PRINTED WIRING BOARD ADDITIVE PROCESS

PROJECT NO: 376 3147



TYPES OF LAMINATES

**TITLE: ADDITIVE PROCESS FOR
FABRICATION OF PRINTED
CIRCUIT BOARDS.**

COST: \$250,000

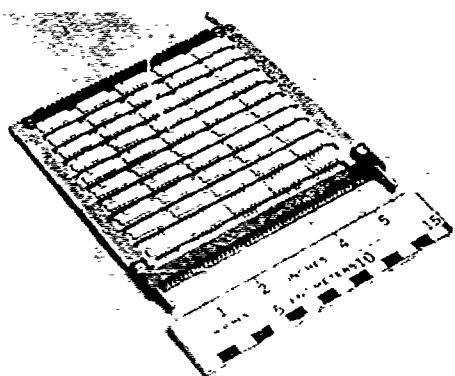
RESULTS

**DEVELOPED THE DESIGN FOR AN AUTOMATED
PRODUCTION LINE USING THE ADDITIVE
PROCESS FOR FABRICATION OF PRINTED
CIRCUIT BOARDS. THE PROCESS WAS
VERIFIED IN A PILOT PRODUCTION LINE BY
FABRICATING 90 BOARDS USING THE ULTRA
THIN COPPER CLAD PROCESS.**

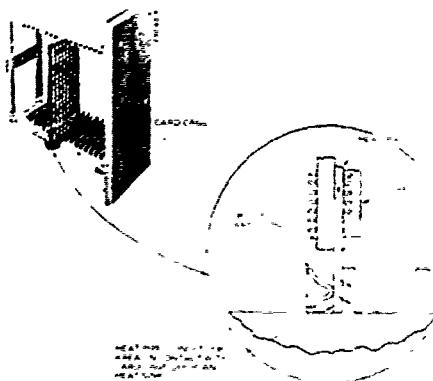
**WHEN IMPLEMENTED, AN ESTIMATED
SAVINGS OF \$2.7 MILLION WILL RESULT.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

HEAT PIPES FOR CIRCUIT CARDS



**HEAT PIPE CARD WITH
DIPS INSTALLED**



**REPRESENTATIVE HEAT PIPE
APPLICATION**

PROJECT NO: R77 3168

**TITLE: METHODS FOR MANUFACTURING
HEAT PIPES FOR CIRCUIT CARDS**

COST: \$172,000

RESULTS

A PRODUCTION TECHNIQUE WAS DEVELOPED FOR FABRICATING INTEGRATED HEAT PIPES FOR PRINTED CIRCUIT BOARDS. A RATE OF 50 PER HOUR WAS ACHIEVED. THE TECHNIQUE IS APPLICABLE TO A VARIETY OF HEAT PIPE CONFIGURATIONS.

IMPLEMENTATION OF THIS PROJECT COULD RESULT IN ESTIMATED BENEFITS OF OVER \$10 MILLION.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT COMPONENT SCREENING

PROJECT NO: 3 76 3224

**TITLE: SCREENING OF ELECTRONIC
COMPONENTS**

COST: \$299,234

RESULTS

**MIL-STD-883 SCREENING TESTS
ARE INADEQUATE TO DETECT
MARGINAL BONDING. THREE NEW
TESTS WERE IDENTIFIED AND
EVALUATED.**

**NO CORRELATION WAS FOUND
BETWEEN DEVICE FAILURES AND
MOISTURE CONTENT WITHIN THE
DEVICE. ADDITIONAL EFFORT IS
REQUIRED TO EXPLAIN THIS
UNEXPECTED RESULT.**

**SEVERAL OTHER SCREENING TESTS
WERE DEVELOPED FOR MOS/LSI
DEVICES. IMPLEMENTATION OF THIS
PROJECT WILL RESULT IN
ESTIMATED SAVINGS OF \$1.5
MILLION.**



OVER BONDED LEAD

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT LOCASERTS

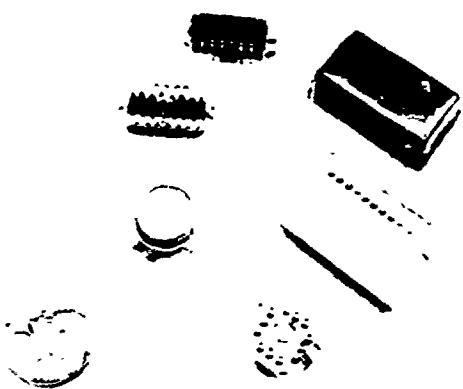


Figure 1
COMPONENTS IN LOCASERTS

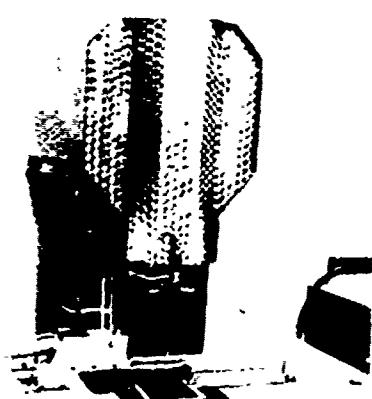


Figure 2 - INSERTION MACHINE

PROJECT NO: 3 76 3225

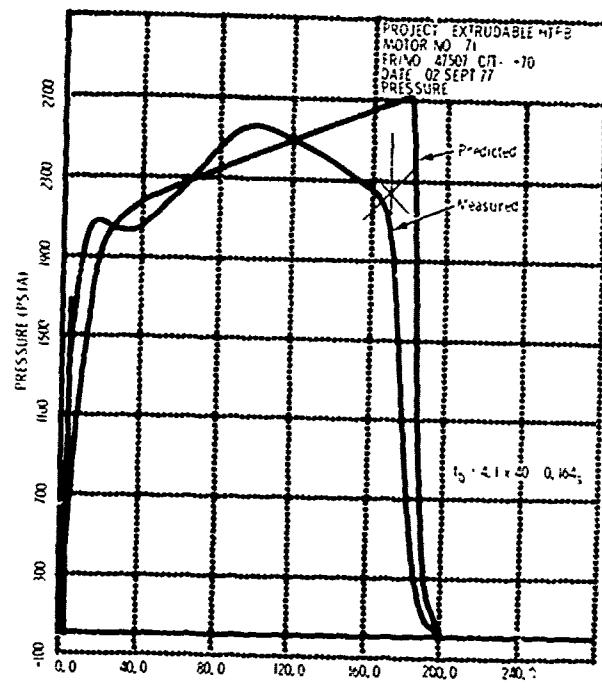
TITLE: PRODUCTION METHODS FOR
MOUNTING NON-AXIAL LEAD
COMPONENTS

COST: \$195,000

RESULTS

- MARTIN-MARIETTA CORP. ENHANCED AUTOMATIC INSERTION METHODS FOR NON-AXIAL LEAD ELECTRONIC PACKAGES: DUAL-IN-LINE, (DIP), PIN THROUGH HYBRIDS, AND TO-TYPE CANS.
- THEY DEVELOPED A PLASTIC, INJECTION MOLDED, LOCATOR-INSERTER (LOCASERT) PAD AND A COMPONENT INSERTION MACHINE TO POSITION THIS PAD.
- LOCASERTS REDUCE PRINTED CIRCUIT BOARD (PCB) ASSEMBLY TIME AND COST ON ALL LEVELS FROM MANUAL TO COMPLETE AUTOMATION.
- IMPLEMENTATION OF THIS PROJECT WILL RESULT IN AN ESTIMATED SAVINGS OF \$760,000 PER YEAR.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT EXTRUSION OF PROPELLANTS



PROJECT NO: 376 3228 AND 37T 3228
TITLE: PRODUCTION METHODS FOR
EXTRUDABLE HTPB PROPELLANT
COST: \$95,000

RESULTS

AN AUTOMATED MISSILE PROPELLANT LOADING AND ASSEMBLY SYSTEM WAS DEVELOPED. TEMPERATURE AND CATALYST LEVELS WERE DETERMINED TO OPTIMIZE THE PROPELLANT QUICK CURE. NO PRODUCT QUALITY DEGRADATION WAS NOTED.

ANTICIPATED BENEFITS INCLUDE LOWER PRODUCTION COSTS THROUGH THE ELIMINATION OF BATCH OPERATIONS. A FOLLOW-ON PROJECT WILL LOAD 50 VIPER MOTORS BY THE NEW MANUFACTURING METHODS.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT FLUIDIC CONTROLS

PROJECT NO: 5 73 1139

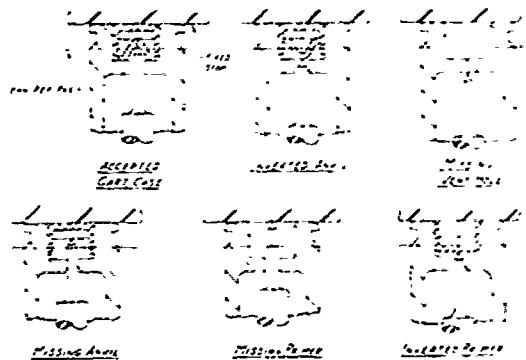
**TITLE: APPLICATION OF FLUID LOGIC
CONTROL CIRCUITRY TO
PYROTECHNIC LOADING**

COST: \$100,000

RESULTS

**TWO MACHINES WERE SUCCESSFULLY
INSTRUMENTED WITH THE FLUIDIC
LOGIC CONTROL CIRCUITRY. THEY
WERE THE BINARY FILLING AND
CLOSING MACHINE AND THE NOSE
CLOSURE REMOVAL AND BURSTER
SENSING MACHINE.**

**THE PRIMARY ADVANTAGE OF FLUIDIC
DEVICES IS THAT THEY DO NOT
PRODUCE SPARKS THAT ARE
HAZARDOUS IN AN EXPLOSIVE
ENVIRONMENT.**



**FLUIDIC CONTROLLED
CARTRIDGE INSPECTION**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT GAS FILTERING

PROJECT NO: 573 1248 AND 575 1248

**TITLE: EVALUATION OF EXHAUST FILTER
SYSTEMS TO ESTABLISH DESIGN
CRITERIA TO MEET AIR POLLUTION
STANDARDS**

COST: \$444,000

RESULTS

**A TEST APPARATUS FOR DETERMINING
THE PERFORMANCES OF GAS FILTERS
WAS DEVELOPED.**

**SIX GAS FILTERS WERE TESTED AND ALL
WERE DETERMINED TO PERFORM SATIS-
FACTORILY WHEN USED TO FILTER NERVE
GAS SIMULANT, NERVE AGENT, PHOSGENE
AND CYANOGEN CHLORIDE.**

**SAFETY WILL BE ENHANCED WITH THE
APPLICATION OF THIS EFFORT IN ENGI-
NEERING DESIGN REQUIREMENTS FOR
FUTURE AIR VENTILATION SYSTEMS.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT LEVEL AND FLOW MEASUREMENTS

PROJECT NO: 5 74 1261

TITLE: PROVISION OF PROTOTYPE EQUIPMENT FOR DETERMINATION OF LEVEL IN WHITE PHOSPHORUS STORAGE TANKS

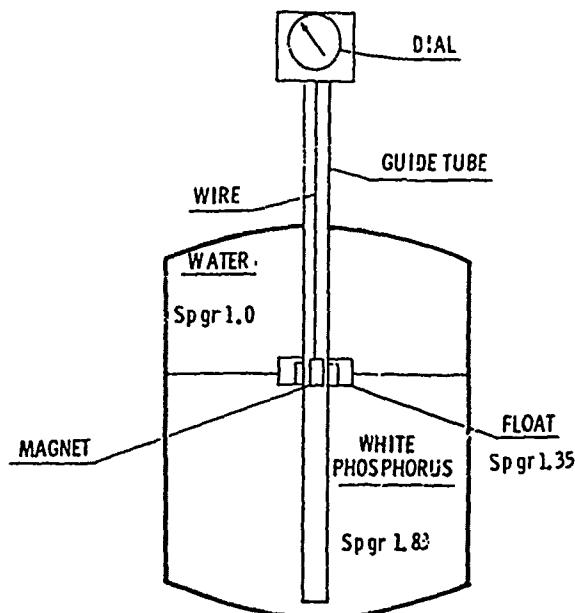
COST: \$40,000

RESULTS

TWO PROTOTYPE SYSTEMS WERE DEVELOPED TO SOLVE THE WHITE PHOSPHORUS MEASURING PROBLEMS. ONE SYSTEM MEASURES THE LEVEL IN THE TANKS AND THE OTHER MEASURES THE FLOW RATE AND TOTAL PUMPAGE.

THE LEVEL MEASURING SYSTEM UTILIZES MAGNETIC COUPLING BETWEEN THE FLOAT AND THE REACTANT TO MINIMIZE CONTACT WITH THE CORROSIVE MATERIALS.

THE FLOWMETER UTILIZES ULTRA SONIC WAVES AGAIN MINIMIZING THE AMOUNT OF EQUIPMENT IN CONTACT WITH THE CORROSIVE MATERIALS.



DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT RED PHOSPHOROUS GRENADES

PROJECT NO: 5 7T 1337 & 5 77 1337

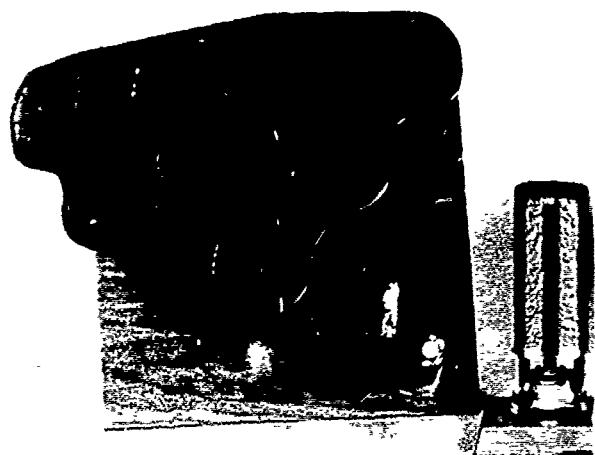
**TITLE: ENGINEERING STUDIES FOR
ADAPTIVE TRANSFER OF
UNITED KINGDOM TECHNOLOGY:
RP/BUTYL GRENADES**

COST: \$604,000

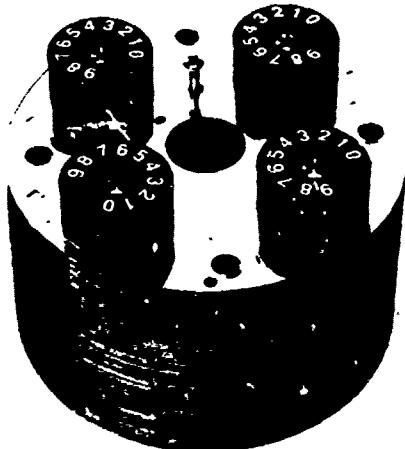
RESULTS

**THIS PROJECT PROVIDED THE
TECHNOLOGY REQUIRED TO PRODUCE
THE UNITED KINGDOM'S RED
PHOSPHOROUS GRENADE IN THE US.
A PILOT PLANT WAS CONSTRUCTED
AND THE PROCESSES WERE
DEVELOPED. GRENADES WERE
PRODUCED AND FIELD TESTED
SUCCESSFULLY, THEREBY VERIFYING
THE PROCESSES. THE TECHNICAL
DATA PACKAGE WAS COMPLETED;
THE FACILITIES PROJECT TO
IMPLEMENT THIS EFFORT IS PENDING.**

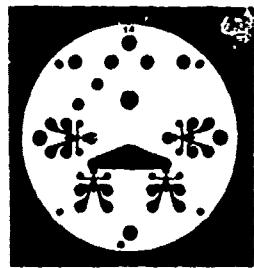
M239 LAUNCHER/L8A1 GRENADE



DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT FLUIDICS



COMPLETED PDM UNIT



**TYPICAL ACTIVE ELEMENT
SHIM**

PROJECT NO: 574 3049 AND 376 3141

**TITLE: FLUIDIC MANUFACTURING AND
ASSEMBLY PROCESSES**

COST: \$440,000

RESULTS

**FLUIDIC PULSE DURATION MODULATORS
(PDM) WERE FABRICATED USING AN
ALUMINUM STRUCTURE.**

**THE ETCHING PROCESS PRODUCED HIGH
QUALITY LAMINATES WITH CONSISTENT
REPRODUCIBLE RESULTS FOR STOCK
THICKNESSES TO 15 MILS.**

**DIFFUSION BONDING OF UNCOATED
ALUMINUM ALLOY SHIMS WAS OBTAINED
WITH HIGHLY CONSISTENT RESULTS.**

**IMPLEMENTATION OF THIS PROJECT
WOULD RESULT IN ESTIMATED SAVINGS
OF \$200,000 PER YEAR.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT AUTOMATED FUZE TESTING

PROJECT NO: 5 73 3051

**TITLE: ENGINEERING AND FABRICATION
OF ELECTRONIC AND ELECTRO-
MECHANICAL INSPECTION TEST
EQUIPMENT FOR FUZE
PROCUREMENT PROGRAMS**

COST: \$250,000

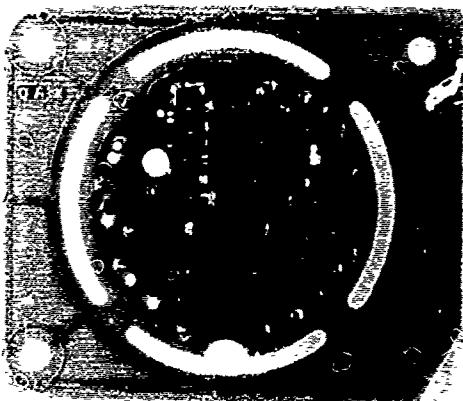
RESULTS

**THE FUZE ACCEPTANCE TESTER WAS
MODERNIZED WITH THE LATEST
CIRCUITRY FOR HIGH VOLUME
PRODUCTION OF M732 FUZES.**

**THE USABLE LIFE OF THE TARGET
SIGNAL SIMULATOR WAS INCREASED
BY TEN YEARS.**

**THE IMPROVED POWER SUPPLY
TELEMETRY SYSTEM IS BEING USED IN
SUPPORT OF THE M728 AND M732
PROGRAM.**

**COST SAVINGS ARE ESTIMATED TO
BE \$250,000 PER YEAR.**



M732 CIRCUIT BOARD

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT AUTOMATED ASSEMBLY

PROJECT NO: 5 71 4041 & 5 74 4041

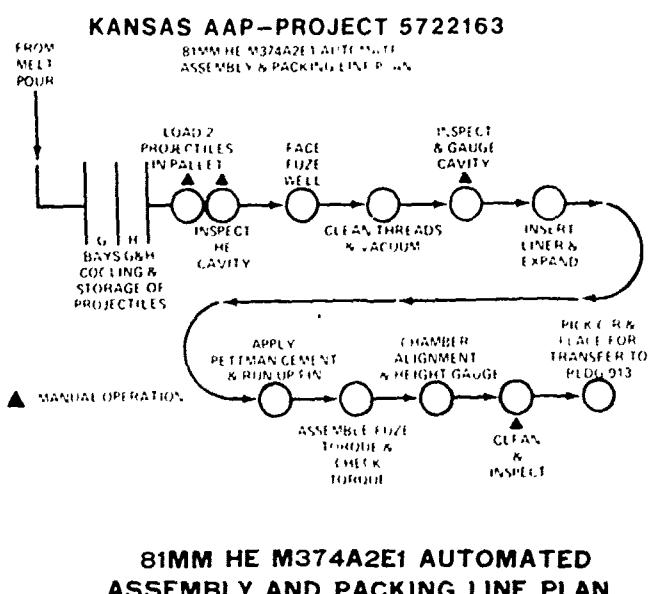
TITLE: DEVELOPMENT OF AUTOMATED EQUIPMENT FOR ASSEMBLY OF MORTAR COMPONENTS

COST: \$260,000

RESULTS

THESE PROJECT YEARS OF EFFORT ESTABLISHED THE OPTIMUM SEQUENCE OF OPERATIONS FOR THE AUTOMATED EQUIPMENT REQUIRED TO LOAD, ASSEMBLE, AND PACK THE 60MM AND 81MM PROPELLING CHARGES AND IGNITION CARTRIDGES. THE FINAL PLANS FROM THESE PROJECTS WERE USED FOR THE FOLLOW-ON PROJECTS.

UPON COMPLETION AND IMPLEMENTATION OF THE ENTIRE EFFORT, AN AUTOMATED LINE WILL BE AVAILABLE.



DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT ARTILLERY ACCEPTANCE TESTING

**PROJECT NO: 573 4139, 574 4139, 577 4139,
AND 578 4139**

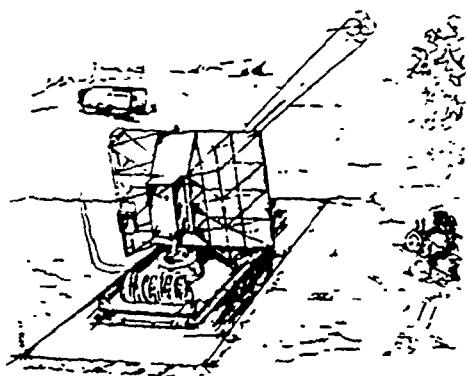
**TITLE: APPLICATION OF RADAR TO BALLISTIC
TESTING OF AMMUNITION (ARBAT)**

COST: \$3,022,000

RESULTS

A PHASED ARRAY RADAR SYSTEM WAS DEVELOPED AND CONSTRUCTED THAT CAN ACCURATELY TRACK ARTILLERY ROUNDS, MORTAR ROUNDS, AND ROCKETS FROM LAUNCH TO IMPACT. VITAL CHARACTERISTICS SUCH AS SPACE POSITION, TRUE VELOCITY, ACCELERATION, DRAG, AND RADAR CROSS SECTION IS NOW AVAILABLE IN REAL OR NEAR REAL TIME. FURTHER ENHANCEMENTS OF THIS SYSTEM ARE BEING DEVELOPED UNDER FOLLOW-ON PROJECTS.

COMPLETION AND IMPLEMENTATION OF THESE PROJECTS WILL RESULT IN ESTIMATED ANNUAL SAVINGS OF \$2.9 MILLION.



SYSTEM CONFIGURATION

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

MELT POUR OF HIGH EXPLOSIVES

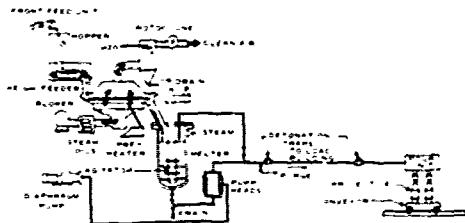
PROJECT NO: 574 4162

TITLE: AUTOMATED LINE FOR THE MELT-POUR PROCESSING OF HIGH EXPLOSIVES

COST: \$1,759,400

RESULTS

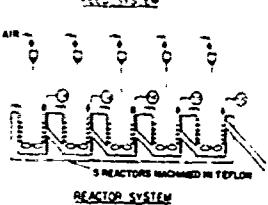
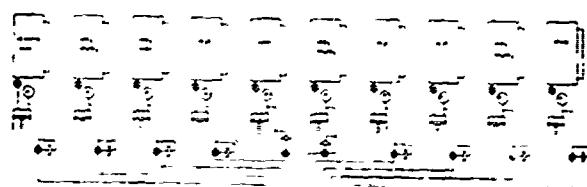
- A MELT METHOD CAPABLE OF SUSTAINING CONTINUOUS OPERATION WAS DEMONSTRATED.
 - A 1/10th SCALE AUTOMATED CONTINUOUS MELT POUR PILOT PLANT WAS CONSTRUCTED.
 - AN AUTOMATED EXPLOSIVE INSPECTION SYSTEM WAS FABRICATED AND TESTED. IMPLEMENTATION OF THIS PROJECT WILL RESULT IN ESTIMATED ANNUAL SAVINGS OF \$1,290,000.



CONTINUOUS MELT-POUR PROCESS FLOW SHEET

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

NITROLYSIS OF HEXAMINE



**CONTINUOUS HMX
REACTOR SYSTEM**

PROJECT NO: 5 71 4171 & 5 72 4171

**TITLE: INVESTIGATION OF PARAMETERS
AFFECTING THE NITROLYSIS
OF HEXAMINE**

COST: \$348,907

RESULTS

**A MINI PILOT PLANT WAS CONSTRUCTED
FOR THE CONTINUOUS PRODUCTION
OF HMX.**

**FEATURES OF THE PLANT INCLUDED:
A VARIABLE FEED SYSTEM.**

**TEMPERATURE CONTROLS FOR EACH
REACTOR.**

**SMALL REACTORS THAT MAINTAINED
THE PROPER HEAT TRANSFER RATES.**

**FEED RATES ADEQUATE TO CONDUCT
MATERIAL BALANCES AND
DETERMINE YIELDS.**

**IMPLEMENTATION OF THIS PROJECT
WILL RESULT IN AN ESTIMATED
SAVINGS OF \$2 MILLION PER YEAR.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT RECRYSTALLIZATION

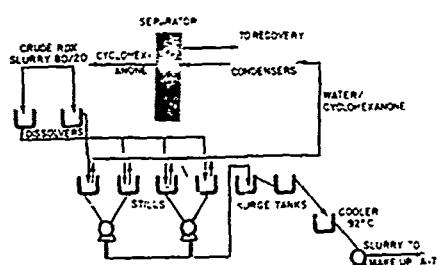
PROJECT NO: 572 4220 & 573 4220

**TITLE: CONTINUOUS RDX
RECRYSTALLIZATION
PROTOTYPE FACILITY**

COST: \$1,560,000

RESULTS

THE CONTINUOUS RDX RECRYSTALLIZATION PROCESS THAT WAS DEVELOPED AT THE START OF THIS PROJECT WAS FOUND TO PRODUCE SMALL AMOUNTS OF ALPHA HMX. THIS MATERIAL IS TOO SENSITIVE TO SAFELY HANDLE; THEREFORE, THE PROJECT WAS REDIRECTED TO AUTOMATE THE BATCH PROCESS. THE AUTOMATED BATCH EQUIPMENT WAS DESIGNED, INSTALLED, AND PROVEN OUT.



**AUTOMATED BATCH
PROCESS**

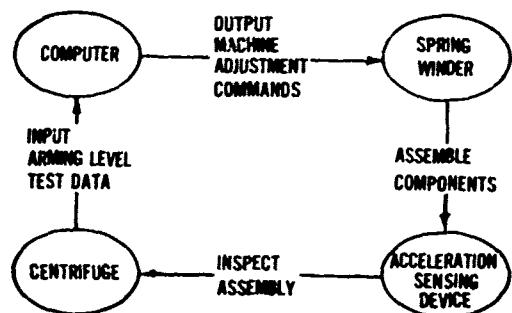
IMPLEMENTATION OF THIS PROCESS WILL RESULT IN AN ESTIMATED PRODUCTION CAPABILITY OF 7.5 MILLION POUNDS OF COMP B PER MONTH.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT COMPUTER AIDED MANUFACTURING

PROJECT NO: 5 74 4255

**TITLE: MMT PRODUCTION CONTROL OF
ACCELERATION SENSING DEVICES
(CAM RELATED)**

COST: \$50,000



**WORK FLOW FOR PROCESS
CONTROL OF SPRING
WINDERS**

RESULTS

**A CONCEPT WAS DEVELOPED FOR LINKING
A CENTRIFUGE TEST WITH THE SPRING
WINDER IN FUZES. THE NEXT STEP WILL
BE FABRICATION OF A FULLY AUTOMATIC
LOAD TESTER AND A MINICOMPUTER
CONTROLLED SPRING WINDER.**

**ECONOMIC FEASIBILITY OF THIS CONCEPT
IS DEPENDENT ON PRODUCTION REQUIRE-
MENTS, AND DESIGN CONSIDERATIONS
FOR FUZES, SPRINGS AND AUTOMATIC
FUZE ASSEMBLY EQUIPMENT.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT FUZE ASSEMBLY

PROJECT NO: 576 4280 & 577 4280

**TITLE: M577 FUZE AUTOMATIC PROCESS
CONTROL PROTOTYPE EQUIPMENT**

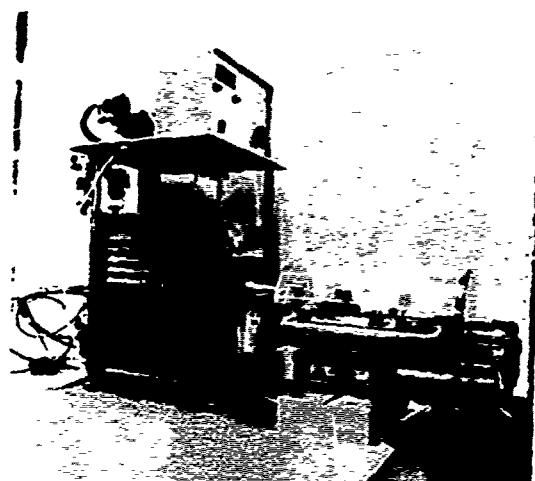
COST: \$1,108,000

RESULTS

**TWO MACHINES WERE DEVELOPED UNDER
THESE PROJECTS THAT AUTOMATICALLY
BALANCE THE BALANCE WHEEL ASSEMBLY
AND ADJUST THE BEAT RATE OF THE TIMER.**

**THE BALANCING MACHINE AUTOMATICALLY
DETERMINES THE POINT OF UNBALANCE
AND, BY MEANS OF A LASER, REMOVES
MATERIAL.**

**THE BEAT RATE IS AUTOMATICALLY
ADJUSTED BY SEQUENTIALLY SHORTENING
THE HAIR SPRING (USING ULTRASONIC
WELDING) UNTIL SPECIFICATIONS ARE MET.
THE MACHINES HAVE BEEN FURNISHED A
SUPPLIER FOR INTEGRATION INTO THE
FUZE MANUFACTURING.**



**AUTOMATIC REGULATION
MACHINE**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT EXPLOSIVES SAFE SEPARATION

PROJECT NO: 57T 4288

**TITLE: EXPLOSIVE SAFE SEPARATION AND
SENSITIVITY CRITERIA**

COST: \$139,261

RESULTS

**A MINIMUM NON-PROPAGATING DISTANCE
FOR 8-INCH M106 HE PROJECTILES IS ONE
FOOT IF 3 INCH DIAMETER ALUMINUM
SHIELDING RODS THE SAME HEIGHT AS
THE PROJECTILES ARE POSITIONED VERTI-
CALLY BETWEEN THE PROJECTILES.**

**THIS INFORMATION WILL BE INCORPOR-
ATED INTO SAFETY REGULATORY
DOCUMENTS.**



**SHIELDED CONFIRMATORY
TEST SET-UP**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT EXPLOSIVES SAFE SEPARATIONS

PROJECT NO: 576 4288

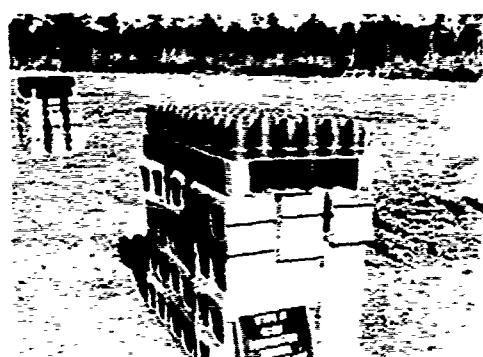
**TITLE: EXPLOSIVE SAFE SEPARATION AND
SENSITIVITY**

COST: \$592,814

RESULTS

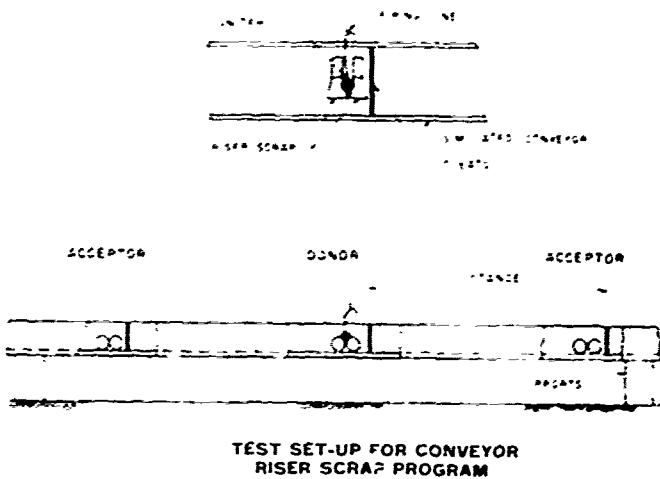
THE PROJECT ANALYZED AND IDENTIFIED APPROPRIATE SEPARATION DISTANCE FOR SAFE LOADING AND HANDLING OF AMMUNITION. A VARIETY OF PROJECTILES WERE CONSIDERED. AS AN EXAMPLE, THE SAFE DISTANCE FOR LOADING SEPARATE 81MM PROJECTILES WAS 18 INCHES AND FOR A PALLET OF LOADED 81MM PROJECTILES WAS 30 FEET.

THE RESULTS WILL BE INCORPORATED INTO THE APPROPRIATE SAFETY REGULATIONS.



**TEST CONFIGURATION
PRIOR TO IGNITION**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT SAFETY



PROJECT NO: 5 77 4288

**TITLE: EXPLOSIVE SAFE
SEPARATION AND SENSITIVITY
CRITERIA**

COST: \$566,669

RESULTS

- THIS PROJECT DETERMINED THE SAFE SEPARATION DISTANCES BETWEEN 105MM M1 PROJECTILE COMPOSITION B RISER SCRAP.
- TEST SERIES WERE PERFORMED WITH THE ZAMAC FUNNELS AND WITHOUT THE FUNNELS FOR TWO AND FOUR RISER UNITS.
- RESULTS OF THIS PROJECT WERE APPLIED TO THE MODERNIZATION OF THE LONE STAR ARMY AMMUNITION PLANT.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT BLAST EFFECTS

PROJECT NO: 5 76 4291

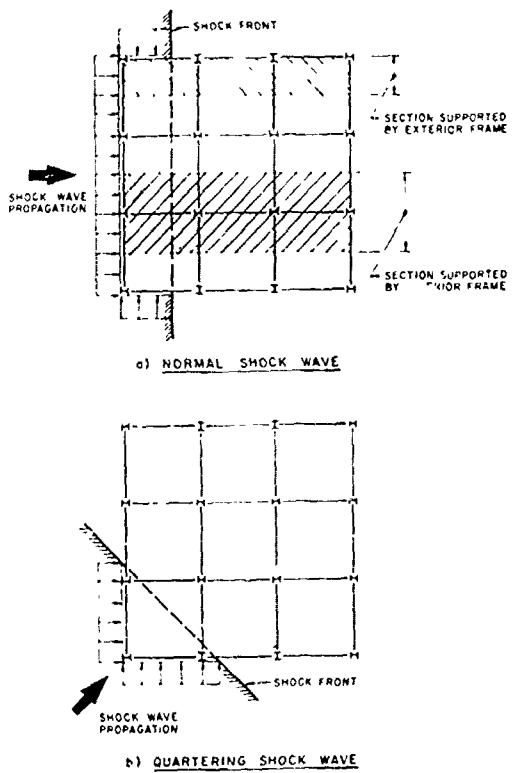
TITLE: BLAST EFFECTS IN THE
MUNITION PLANT
ENVIRONMENT

COST: \$699,619

RESULTS

SEVERAL AREAS OF CONCERN WERE COVERED BY THIS PROJECT. THEY INCLUDED BLAST CAPACITY EVALUATION OF BARRICADES, EFFECTS OF SIMULTANEOUS DETONATIONS, BLAST CAPACITY OF WINDOWS AND FRAMES, GROUND SHOCK EFFECTS FROM EXPLOSIONS, AND A COMPUTER PROGRAM THAT CAN SIMULATE THE EFFECTS OF BLAST OVERPRESSURES ON FRAME STRUCTURES.

THE RESULTS OF THIS PROJECT WILL BE INTEGRATED INTO SAFETY REGULATORY DOCUMENTS.



LOADING CONDITIONS
FOR BI-AXIAL BENDING

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT NITROCELLULOSE (NC) PURIFICATION

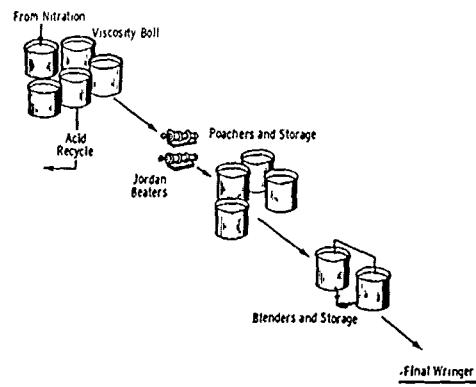
PROJECT NO: 5 77 4341

**TITLE: IMPROVED NITROCELLULOSE
PURIFICATION PROCESS**

COST: \$165,000

RESULTS

THIS PROJECT INVESTIGATED EXISTING METHODS FOR APPLICATION TO NITROCELLULOSE PURIFICATION. THE "CONICELL" SYSTEM MANUFACTURED BY MOSER PROCESSING WAS SELECTED FOR THE CONTINUOUS PURIFICATION DESIGN. THE DESIGN ALLOWS FOR ACID BOILING FOLLOWED BY SODA-ASH INJECTION AND POACHING. THE UNIT WILL CARRY A 10% NC SLURRY WITH A RESIDENCE TIME OF 45 MINUTES AT A RATE OF 2000 POUNDS PER HOUR. COMPLETION AND IMPLEMENTATION OF THIS PROCESS CAN RESULT IN ESTIMATED SAVINGS OF UP TO \$1.2 MILLION PER YEAR.



**PRINCIPAL OPERATIONS
IN THE BATCH PROCESS
FOR NC PURIFICATION**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT DIE CAST HOUSINGS

PROJECT NO: 5 77 4416

**TITLE: DEVELOP AND PROVEOUT OF
ALTERNATE MANUFACTURING
PROCESSES FOR S + A**

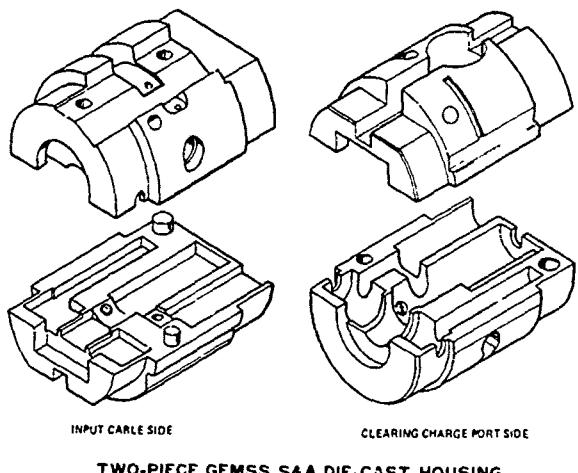
COST: \$120,000

RESULTS

THIS PROJECT PROVIDED THE FABRICATION AND VERIFICATION TESTING OF AN ALTERNATE SAFE AND ARMING HOUSING FOR USE IN THE GEMSS MINE SYSTEM. OTHER APPLICATIONS OF THIS HOUSING ARE GATOR AND MOPMS.

THIS DIE CAST PART IS CONSIDERABLY SIMPLER AND LESS EXPENSIVE THAN THE BAR STOCK FABRICATED PART.

IMPLEMENTATION OF THIS PROJECT WILL RESULT IN ESTIMATED SAVINGS OF \$1.6 MILLION PER YEAR.

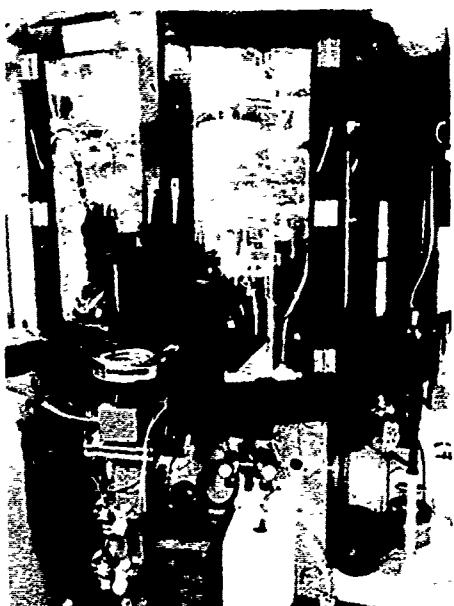


INPUT CABLE SIDE

CLEARING CHARGE PORT SIDE

TWO-PIECE GEMSS S&A DIE-CAST HOUSING

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT DETONATOR LOADING



X4 SERIES IOWA LOADER

PROJECT NO: 5 7T 4457

**TITLE: MULTI-TOOLED IOWA
DETONATOR LOADING
MACHINE**

COST: \$332,000

RESULTS

**THE OBJECTIVE OF THIS PROJECT
WAS TO INCREASE THE OUTPUT OF
AN IOWA DETONATOR LOADER TO
150 UNITS/MINUTE. THE GOAL WAS
ACCOMPLISHED BY RETROFITTING
AN EXISTING LOADER WITH A SET
OF MULTIPLE LEVEL TOOLING. QUAD
TOOLING WAS DETERMINED TO BE
OPTIMUM.**

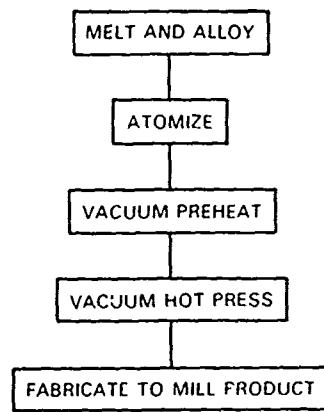
**IMPLEMENTATION OF THIS PROJECT
WILL RESULT IN AN ESTIMATED
COST SAVINGS OF \$1.5 MILLION
DOLLARS AT THE PEACETIME RATE.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT ALUMINUM ALLOY POWDER METALLURGY

PROJECT NO: 5 72 6335

**TITLE: HIGH STRENGTH ALUMINUM ALLOY
SHAPES BY POWDER METALLURGY**

COST: \$440,000



POWDERED METAL PROCESS

RESULTS

**POWDERED METAL PLATE WAS PRODUCED
AND SHOWED HIGHER TENSILE STRENGTH
AND NOTCHED FATIGUE STRENGTH,
SUPERIOR CORROSION CRACKING RESIS-
TANCE, AND TOUGHNESS EQUAL TO
COMMERCIAL INGOT METALLURGY ALLOYS.**

**POWDERED METAL EXTRUSIONS AND DIE
FORGINGS EXPERIENCED SIMILAR IM-
PROVEMENTS IN PROPERTIES.**

**THE IMPROVEMENT IN PROPERTIES FROM
THIS PROCESS HAS RESULTED IN SEVERAL
COMMERCIAL EFFORTS BEING UNDER
TAKEN TO MORE FULLY EXPLOIT THE
DEVELOPMENT.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT TUNGSTEN FRAGMENTS

PROJECT NO: 5 71 6388

Composition by weight:

Nickel - 5.0 ± 0.2%
Iron - 5.0 ± 0.2%
Impurity Elements - 0.005% max each
 0.1% max total
Tungsten - remainder

Density: 17.00 ± 0.10 gm/cc

Mechanical Properties:

Compressive Yield Strength
80,000 psi at 0.2% offset with no
visible cracks after testing.

Hardness

Average Rockwell C 24 to 26.

Ultimate Tensile Strength

123,000 psi Min

Elongation

15% min in one inch

MAJOR REQUIREMENTS

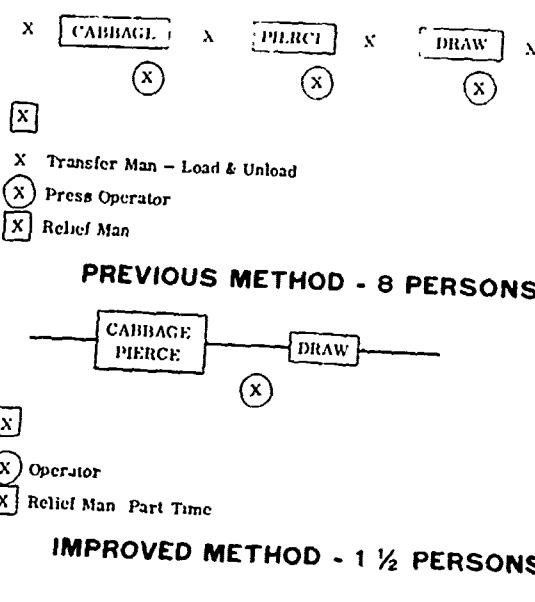
**TITLE: PRODUCTION OF HIGH DENSITY
TUNGSTEN BASE PREFORMED
FRAGMENTS**

COST: \$88,000

RESULTS

**THIS PROJECT RESULTED IN A PURCHASE
DESCRIPTION FOR THE MANUFACTURE
OF TUNGSTEN BASED PREFORMED
FRAGMENTS. THE DESCRIPTION WAS
VERIFIED BY PROCURING 250,000 CUBE
PENETRATORS. THE INITIAL PURCHASE
POINTED OUT A NEED FOR MORE
TECHNICAL GUIDANCE TO OBTAIN
ACCEPTABLE FRAGMENTS.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT METAL PARTS



PROJECT NO: 5 73 6550

**TITLE: ENGINEERING IN SUPPORT OF
ARTILLERY METAL PARTS
MODERNIZATION PROGRAM**

COST: \$480,187

RESULTS

**AMMUNITION METAL PARTS PLANTS
WERE SURVEYED FOR MANUFACTURING
IMPROVEMENTS. TYPICAL FINDINGS
RESULTED IN:**

**DEVELOPING AN AUTOMATIC LOADER
FOR FORGING PRESSES, THEREBY
REDUCING PERSONNEL REQUIREMENTS
FROM 8 TO 1.5.**

**DEVELOPING INDIVIDUAL HYDRAULIC
TRANSFER UNITS TO REPLACE A
CONSTANT HEAD SYSTEM THEREBY
REDUCING THE HORSEPOWER
REQUIREMENT BY 1650.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT FILAMENT WOUND CANNON TUBE

PROJECT NO: 672 6681 AND 673 6681

**TITLE: APPLICATION OF FILAMENT
WINDING TO CANNON AND
CANNON COMPONENTS**

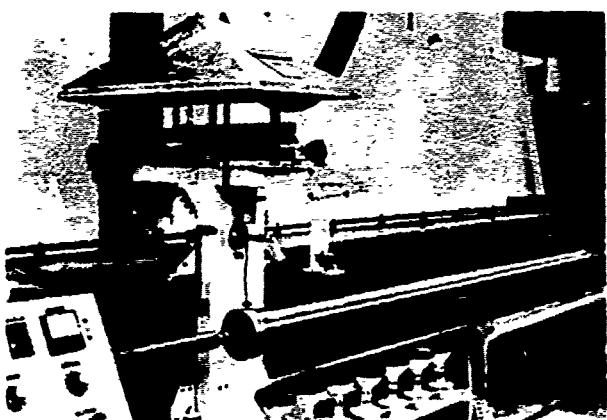
COST: \$200,000

RESULTS

**A FILAMENT WINDING MACHINE WAS
PURCHASED THAT HAS THE FLEXI-
BILITY FOR HANDLING A VARIETY OF
GEOMETRIC SHAPES.**

**NUMEROUS LINERS FOR 106MM TEST
CYLINDERS WERE FABRICATED AND
THEN WOUND WITH A STEEL FILA-
MENT/EPOXY JACKET.**

**THE COMPOSITE TUBE 30% LIGHTER
THAN A CONVENTIONAL TUBE.**



**WINDER AND WOUND
COMPOSITE TUBE**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT BARREL PLATING

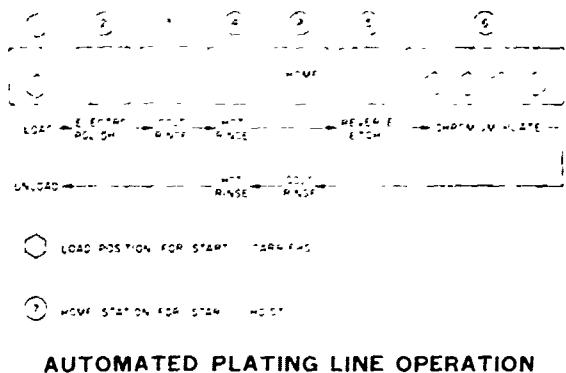
PROJECT NO: 6 72 6786

**TITLE: AUTOMATION OF GUN BARREL
BORE CHROMIUM PLATING
PROCESS**

COST: \$70,000

RESULTS

- AN AUTOMATED PLATING SYSTEM WAS PURCHASED AND THE PROCESSES TO PLATE 5.56MM BARRELS WERE DEVELOPED. A ROTATING ELECTRODE IS USED IN THE PLATING PROCESS TO ELIMINATE THE REQUIREMENT FOR OPERATOR ALIGNMENT.
- THE EQUIPMENT CAN BE SWITCHED TO A MANUAL MODE OF OPERATION FOR SPECIAL PROCESSING.
- IMPLEMENTATION OF THIS PROCESS WILL RESULT IN AN ESTIMATED \$250,000 SAVINGS FOR EACH 100,000 BARRELS.



DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT SMALL ARMS PARTS MOLDING

PROJECT NO: 6 72 6838

GOAL: MANUFACTURING SIMPLIFICATION AND COST REDUCTION IN THE MANUFACTURE OF PLASTIC COMPONENTS OF SMALL ARMS AND AIRCRAFT ARMAMENT

COST: \$50,000

RESULTS

THE PROCESSES DEVELOPED UNDER THIS PROJECT WILL SIMPLIFY MANUFACTURING TECHNIQUES, LOWER COSTS, AND IMPROVE THE PROPERTIES OF SMALL ARMS NON-METALLIC PARTS. INJECTION MOLDING IS APPROXIMATELY SIX TIMES FASTER THAN COMPRESSION MOLDING.

THIS PROJECT WILL BE IMPLEMENTED UNDER PROJECT'S 6XX 7419.

	<u>CM*</u>	<u>IM**</u>	<u>CM*</u>	<u>IM**</u>	<u>CM*</u>	<u>IM**</u>
Mold Temperature	315°F	330°F	315°F	330°F	280°	—
Molding Pressure	3Kpsi	18Kpsi	2Kpsi	15Kpsi	2K	—
Total Cycle Time	6 min	60 sec	6 min	75 sec	—	—

* CM - Compression Molding

** IM - Injection Molding

SELECTED PARAMETERS

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT DEWAR PROCESS IMPROVEMENTS

PROJECT NO: 6 73 7056

**TITLE: DEWAR MATERIALS AND
MANUFACTURE**

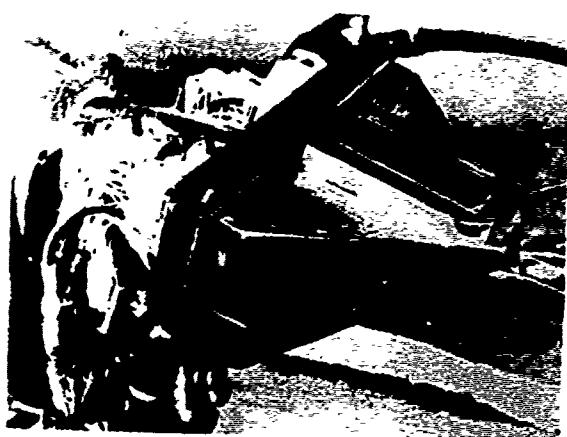
COST: \$195,000

RESULTS

**A METAL DEWAR THAT CAN BE
REPAIRED AND RESEALED WAS
DESIGNED TO HOUSE THE LINEAR
ARRAY.**

**A HIGH VACUUM CAN NOW BE
MAINTAINED FOR OVER A YEAR
WITHOUT ACTIVE PUMPING.**

**THIS DESIGN DOUBLED THE
OPERATIONAL LIFE OF THE
ASSEMBLY.**



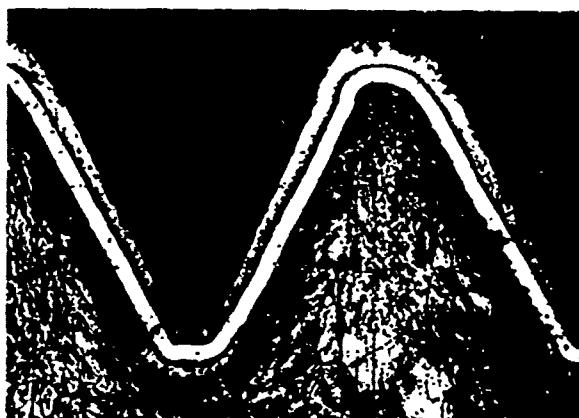
SEALED METAL DEWAR

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT ELECTROLESS NICKEL PLATING

PROJECT NO: 673 7124

**TITLE: EFFECT OF ELECTROLESS
NICKEL PROCESS VARIABLES
ON QUALITY REQUIREMENTS**

COST: \$40,000



**BRASS BOLT PLATED WITH
ELECTROLESS NICKEL AND
OVERPLATED WITH NICKEL**

RESULTS

**PROCEDURES FOR PLATING GUN
BORES WITH ELECTROLESS NICKEL
WERE DETERMINED. A RANGE OF
HARDNESSES CAN BE PREDICTED BY
TAKING INTO CONSIDERATION THE
PHOSPHORUS CONTENT AND USING
THE PROPER THERMAL TREATMENT
ON THE ITEM.**

**FOR HEAVY BUILDUP, CONSTANT
MONITORING OF THE BATH
PARAMETERS IS NECESSARY.
PROCESS SPECIFICATIONS ARE
AVAILABLE.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT NUMERICAL CONTROL PART PROGRAMMING

PROJECT NO: 6 72 7220

**TITLE: MMT APPLICATION AND UTILIZATION
OF MINI-COMPUTERS TO DIRECT
NUMERICAL CONTROL FOR GENERAL
PURPOSE MACHINE TOOLS**

COST: \$140,000

RESULTS

A "UNIAPT" MINICOMPUTER BASED PART PROGRAMMING SYSTEM WITH 3-DIMENSIONAL CONTOURING WAS OBTAINED FOR NC LATHES AND MACHINING CENTERS. THE NC TAPE PREPARATION SYSTEM WAS INTERFACED WITH THE "TRIDEA" DRAFTING AND DIGITIZING SYSTEM FOR CUTTER LOCATION PATH DISPLAY AND VERIFICATION. A COMPUTER NUMERICAL CONTROL "WADELL" LATHE WAS LINKED WITH THE COMPUTER SYSTEM TO ALLOW DIRECT TRANSMISSION OF PART PROGRAMS. LABOR SAVINGS IN TAPE PREPARATION AND INCREASE IN THE WORKLOAD HANDLING CAPABILITY OF THE NC MACHINE TOOLS WERE ACHIEVED.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT INSPECTION USING LASERS

PROJECT NO: 672 7226

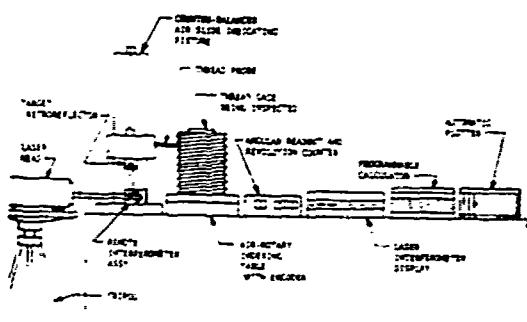
**TITLE: DEVELOPMENT AND PREPARATION
OF MULTI-PURPOSE ULTRA-HIGH
PRECISION LASER QUALITY INSPECTION
APPLICATIONS**

COST: \$150,000

RESULTS

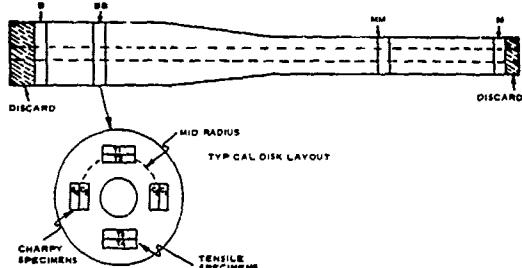
**A LASER THREAD MEASURING SYSTEM
WAS DEVELOPED TO INSPECT THREAD
PITCH, LEAD, AND DEVIATION FROM TRUE
HELICAL PATH OF LARGE THREAD PLUG
GAGES.**

**A LASER OPTICAL MEASURING SYSTEM
WAS DEVELOPED WITH THE CAPABILITY
TO DETERMINE OPTICAL GLASS DENSITY,
GRADE, CURVATURE, FLATNESS, AND
SCRATCH AND DIG CHARACTERISTICS.**



THREAD MEASURING SYSTEM

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT CANNON TUBE PROCESSING



MECHANICAL PROPERTY SAMPLING PLAN

PROJECT NO: 676 7236

**TITLE: APPLICATION OF RAPID HEAT
TREATING TO CANNON TUBES**

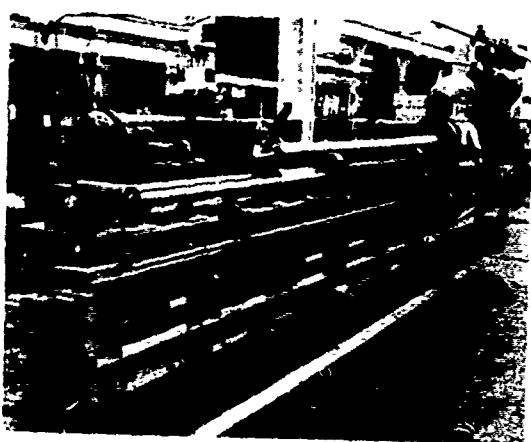
COST: \$190.000

RESULTS

**EIGHT CANNON TUBES WERE SUBJECTED
TO SHORTENED AUSTENITIZING CYCLES.
TESTING OF TENSILE AND CHARPY
IMPACT SAMPLES DEMONSTRATED THAT
ACCEPTABLE PROPERTIES COULD BE
OBTAINED.**

**FURNACE TIME HAS BEEN REDUCED FROM
70 TO 20 HOURS WITH SAVINGS
AVERAGING \$57 PER TUBE. USE OF
FOSSIL FUEL HAS ALSO BEEN REDUCED.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT GUN TUBE IMPROVEMENTS



**TUBE LOADING ASSEMBLY TO
THE POWDER CHAMBER GRINDER**

PROJECT NO: 673 7242

**TITLE: GUN TUBE MANUFACTURE BY
AUTOMATION**

COST: \$195,000

RESULTS

**SEVERAL IMPROVEMENTS TO THE
MACHINING OPERATIONS WERE MADE
INCLUDING:**

- **CONSOLIDATING THE M68 AND M185
PROCESSING.**
- **APPLYING A 3-AXIS N/C MACHIN
ING CENTER TO THE BREECH FACE
EXTRACTOR DETAIL.**
- **GRINDING THE POWDER CHAMBER
FOR THE M68 TUBE.**

**IMPLEMENTATION OF THIS PROJECT
HAS RESULTED IN ESTIMATED
SAVINGS OF \$10,000 PER YEAR.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT OPTICAL REPLICATION

PROJECT NO: 6 73 7261

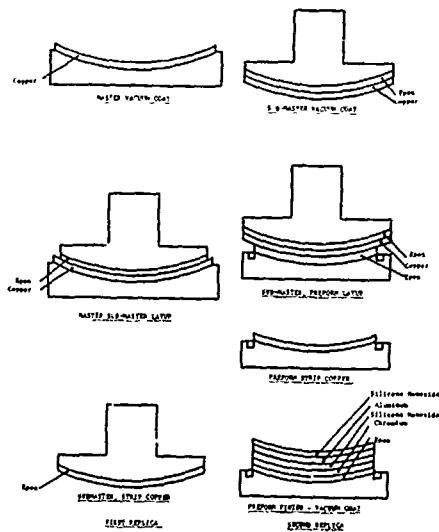
TITLE: THE IMPROVEMENT OF PROCESSES INVOLVED IN PLASTIC REPLICA COMPONENT MANUFACTURE

COST: \$79,718

RESULTS

AN IMPROVED PROCEDURE FOR THE MANUFACTURE OF SPHERICAL AND ASPHERIC MIRRORS BY THE DOUBLE REPLICATION PROCESS USING THIN FILM CAST EPOXY RESINS AS THE REPLICA WAS DEVELOPED.

WHILE THE PROCESS WILL NOT PROVIDE MIRRORS OF THE SAME OPTICAL QUALITY AS PRECISION GLASS MIRRORS, IT WILL PRODUCE LOW COST MIRRORS OF ACCEPTABLE QUALITY FOR MANY APPLICATIONS. IMPLEMENTATION IS DEPENDENT UPON SUFFICIENT QUANTITY REQUIREMENTS TO JUSTIFY SET UP OF A REPLICATION FACILITY.



**DOUBLE REPLICATION
PROCESS**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT NUMERICAL CONTROL

PROJECT NO: 6 73 7265

**TITLE: COMPUTER CONTROLLED
RETICLE ENGRAVING**

COST: \$150,000

RESULTS

**A COMPUTER CONTROLLED SCRIBING
MACHINE WAS DEVELOPED THAT CAN
SCRIBE 10 RETICLES AT ONCE.**

**SCRIBING TIME WAS REDUCED BY 60%
AND SCRIBING DEFECTS REDUCED.
THE NEW METHOD WAS IMPLEMENTED
AT FRANKFORD ARSENAL AND HAD
ACCUMULATED \$19,000 IN SAVINGS
WHEN THE FACILITY WAS CLOSED.
NO FURTHER PRODUCTION WORK IS
PLANNED FOR THIS MACHINE.**



**TEN-POSITION COMPUTER
CONTROLLED OPTICAL
SCRIBING MACHINE**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT HEAT SETTING SPRINGS

PROJECT NO: 6 74 7411

**TITLE: HEAT SETTING PROCEDURES FOR
HELICAL COILED SPRINGS**

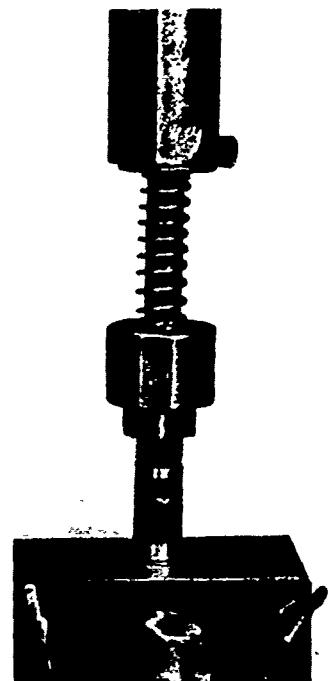
COST: \$50,000

RESULTS

**THIS PROJECT INVESTIGATED A SERIES OF
HEAT SETTING PARAMETERS FOR USE IN
SMALL ARMS APPLICATIONS. HOT SETTING
OF SPRINGS WILL RESULT IN MORE
REPEATABLE PERFORMANCE WHERE THE
OPERATING TEMPERATURE IS ELEVATED
SUCH AS SPRINGS LOCATED ON OR NEAR
THE BARREL OR BOLT OF AN AUTOMATIC
WEAPON.**

**THE THREE MATERIALS TESTED WERE
MUSIC WIRE, STAINLESS STEEL, AND
CHROME VANADIUM WHICH ARE THE
MATERIALS SPECIFIED IN 95% OF WEAPON
APPLICATIONS.**

**PROCESS DATA IS NOW AVAILABLE TO
SMALL ARMS DESIGNERS.**



**HEAT SET SPRING
INSTALLED ON
ENDURANCE TESTER.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT MOLDED M16 HANDGUARD

PROJECT NO: 6 74 7419 & 6 75 7419

**TITLE: LOW COST RECIPROCATING
SCREW MOLDING OF
THERMOSETTING PLASTIC
WEAPONS COMPONENTS**

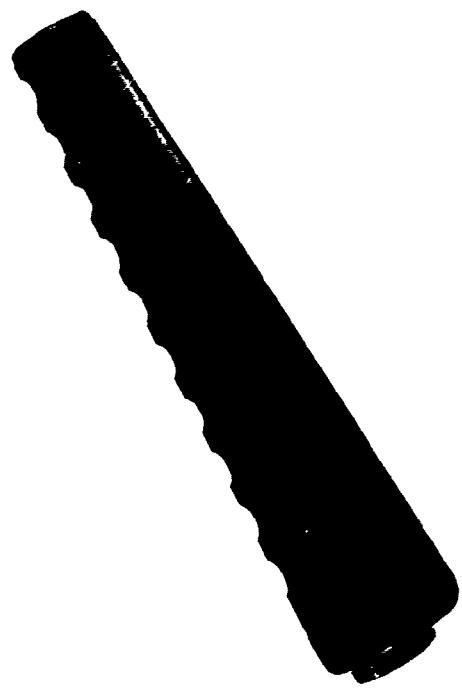
COST: \$110,000

RESULTS

**A RECIPROCATING SCREW INJECTION
MOLDING MACHINE WAS PURCHASED
TO PRODUCE LOW-COST
THERMOSETTING PLASTIC
HANDGUARDS FOR THE M16 RIFLE.**

**A HOT RUNNER MOLDING PROCESS
WAS CHOSEN FOR THIS ITEM SINCE
THE MOLD FABRICATION AND DEBUG
TIME ARE CONSIDERABLY LESS
THAN FOR THE WARM MANIFOLD
METHOD. FIFTY HANDGUARDS WERE
PRODUCED AND SUBMITTED FOR
EVALUATION TESTING.**

**IMPLEMENTATION OF THIS PROJECT
WILL RESULT IN ESTIMATED COST
SAVINGS OF \$85,000 PER YEAR.**



M16 HANDGUARD

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

POWDER METAL PARTS

PROJECT NO: 6 74 7495

**TITLE: CLOSED DIE FORGING OF POWDER
METAL PREFORMS**

COST: \$115,000



SINTERED PREFORMS

RESULTS

**THIS PROJECT ESTABLISHED THE
POTENTIAL USEFULNESS OF EXISTING
FORGE SHOP EQUIPMENT FOR PRODUCING
PRECISION POWDER METAL FORGINGS.**

**THE MECHANICAL PRESS WAS FOUND TO
BE SUPERIOR TO EITHER THE HYDRAULIC
PRESS OR DROP HAMMER.**

**MILITARY WEAPON DESIGNERS HAVE
MORE INFORMATION WITH WHICH TO
SPECIFY P/M FORGED PARTS.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT BORIDE COATED TOOLS

PROJECT NO: 674 7524

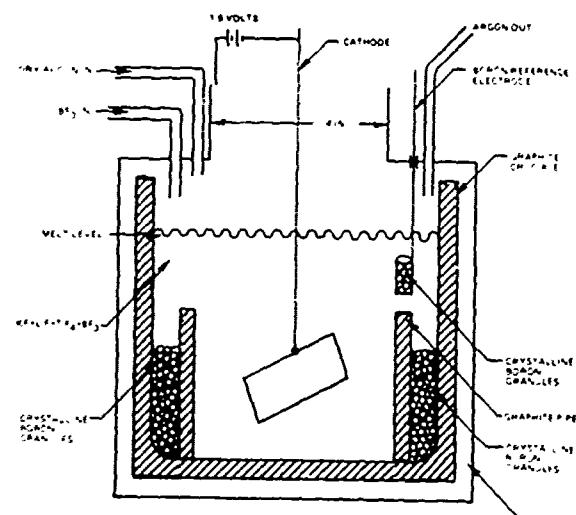
**TITLE: ULTRA HARD BORIDE COATING TO
REDUCE TOOL WEAR**

COST: \$105,000

RESULTS

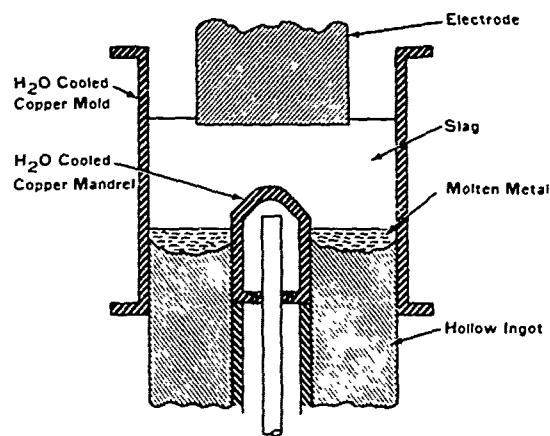
**A 0.3 MIL LAYER OF TiB₂ COATING WAS
APPLIED TO STEEL TO FORM A TOUGH,
VERY HARD, ADHERENT LAYER THAT IS
RESISTANT TO SPALLING AND SURFACE
WEAR.**

**THE COATING INCREASED TOOL LIFE,
PARTICULARLY WHEN DRILLING
FIBERGLASS. UP TO A 7% LABOR AND
TOOL COST SAVINGS CAN BE ACHIEVED.**



PLATING CELL SCHEMATIC

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT ARTILLERY TUBE PRODUCTION



**HOLLOW ESR PROCESS WITH
SOLID ELECTRODE & BOTTOM
MANDREL**

**PROJECT NO: 674 7550 & 675 7550
TITLE: DEVELOPMENT OF PROTOTYPE
PRODUCTION ESR FACILITIES.
COST: \$670,000**

RESULTS

**HOLLOW ELECTRO-SLAG REMELT
INGOTS WERE PRODUCED BY CABOT
CORPORATION. THE HOLLOWS WERE
THEN SATISFACTORILY FORGED INTO
GUN TUBES.**

**THE USE OF HOLLOWS ELIMINATED
TREPANNING AS A PRODUCTION
OPERATION. UPON IMPLEMENTATION;
SAVINGS OF \$500 OR MORE PER TUBE
IS ANTICIPATED.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT SIMULATED SHOCK TESTS

PROJECT NO: 675 7571

**TITLE: SHOCK TEST SIMULATION FOR
FIRE CONTROL INSTRUMENTS**

COST: \$148,000

RESULTS

**ACCEPTABLE SIMULATED PRODUCTION
TESTS WERE DEVELOPED FROM VALIDA-
TION TEST PROCEDURES. THESE TESTS
WERE PERFORMED ON COMMERCIALLY
AVAILABLE SHOCK MACHINES WHICH DID
NOT REQUIRE EXOTIC PREPARATION.**

**THE WORK RESULTED IN IMPROVED
SHOCK TEST METHODS AND SPECS.
UPON IMPLEMENTATION IT IS ESTIMATED
THAT THE NUMBER OF SHOCK TESTS
REQUIRED FOR QUALIFICATION WILL BE
REDUCED BY 50%.**

Apogee System	Fire Control Instruments	Specs	Recommended
VIS-100	VIS-100	Vertical axis to the cardinal directions	20
		Longitudinal	1
		Transverse	25
		Diagonal	25
VIS-200	VIS-200	Vertical axis	25
		Longitudinal forward	2
		Longitudinal aftward	2
The Fire Control	The Fire Control	Vertical axis	50
		Longitudinal forward	1
		Longitudinal aftward	1
WSS-200	WSS-200	Vertical axis	50
		Longitudinal axis	3
WSS-200	WSS-200 Telescop and WSS-200 Volt	Vertical axis	150
		Longitudinal axis	1
	WSS-200 Telescop	Transverse right & left	100
		Vertical axis and spin	50
		Longitudinal axis	1
		Transverse right & left	100

Each instrument is to be shocked a total of 18 times. 3 times in each of the above directions.

SHOCK TEST SPECIFICATIONS

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

FIRE CONTROL TESTING

PROJECT NO: 675 7572

TITLE: THREE-AXIS DYNAMICS SIMULATION OF HELICOPTER ANGULAR MOTION FOR TESTING FIRE CONTROL MATERIEL

COST: \$128,000

RESULTS

- THE THREE-AXIS FLIGHT MOTION SIMULATOR (FMS) WAS FOUND TO BE ABLE TO ACCURATELY SIMULATE FLIGHT TEST DATA TAKEN ON AN AH-1 COBRA HELICOPTER.
- THE RESULTS ARE BEING INCORPORATED INTO DETAILED ENGINEERING SPECIFICATIONS.
- IT IS ESTIMATED THAT THIS PROJECT COULD RESULT IN A 50% REDUCTION IN THE COST OF HELICOPTER FIRE CONTROL PRODUCTION TESTING.

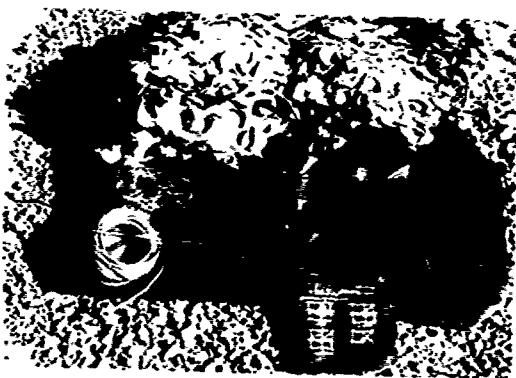
**FSM TABLE OUTPUT
COMPARED TO FLIGHT
TEST DATA**

SECTION III
IMPLEMENTED EFFORTS

DARCOM PRIOR YEAR MM&T IMPLEMENTATION CAMOUFLAGE



CAMOUFLAGE



REPAIR KIT

EFFORT NO: 7 7X 3524

**TITLE: MODULAR SYNTHETIC
CAMOUFLAGE SCREENS**

COST: \$2,605,000

BENEFITS

**PROJECT DEVELOPED MANUFACTURING
METHODS AND EQUIPMENT FOR MASS
PRODUCTION OF A NEW CAMOUFLAGE
SCREEN. THE EQUIPMENT PRODUCES A
RADAR SCATTERING GARNISH AND
APPLIES THE GARNISH TO THE NETTING
IN A PRESCRIBED PATTERN.**

**THE EQUIPMENT IS IN USE AT TWO CAM-
OUFLAGE MANUFACTURING FACILITIES:
(1) BRUNSWICK CORP IN DELAND, FL, AND
(2) DEVILS LAKE SIOUX MFG CO IN
DEVILS LAKE, ND. SAVINGS PER UNIT
FROM USING THE AUTOMATED EQUIP-
MENT IN LIEU OF HAND METHODS IS
\$332/UNIT. WITH 40K SCREENS BEING
PRODUCED EACH YEAR, YEARLY SAVINGS
TOTAL \$13,280,000.**

DARCOM PRIOR YEAR MM&T IMPLEMENTATION DETECTOR MODULES



**UNIVERSAL DETECTOR
MODULE**

EFFORT NO: 2 74 9744

**TITLE: FABRICATION OF UNIVERSAL
DETECTOR MODULES**

COST: \$895,000

BENEFITS

**PROJECT ESTABLISHED A PILOT
PRODUCTION CAPABILITY TO PRODUCE
UNIVERSAL DETECTOR DEWAR MODULES
FOR HG-CD-TE PHOTODETECTOR ARRAYS.
PRIOR TO THIS PROJECT THE MODULES
WERE HAND PRODUCED.**

**TEXAS INSTRUMENTS IS USING THIS
PILOT LINE TO PRODUCE DETECTOR
MODULES FOR THE ARMY'S AN/VSG-2
TANK THERMAL SIGHT. THE MMT PILOT
LINE IS THE ONLY EQUIPMENT ON
WHICH THIS COMPONENT CAN BE MASS
PRODUCED.**

DARCOM PRIOR YEAR MM&T IMPLEMENTATION IMAGE TUBES

EFFORT NO: 2 74 9750

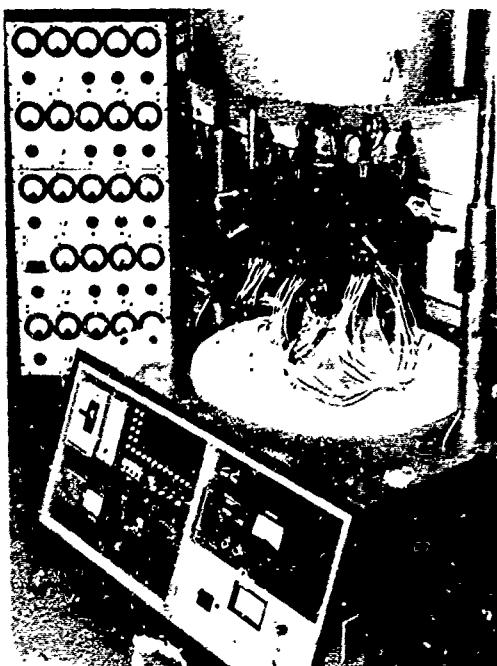
**TITLE: FABRICATION OF 18MM WAFER
IMAGE TUBE BY BATCH
PROCESSING**

COST: \$700,000

BENEFITS

LITTON HAD PREVIOUSLY DEVELOPED A 5-PORT VACUUM PROCESSOR FOR PRODUCING 18MM IMAGE TUBES. THIS PROJECT UPGRADED THIS EQUIPMENT TO INCLUDE ELECTRON GUNS FOR OUT-GASSING AND THE CAPABILITY TO MAKE AN INDIUM SEAL OF THE PHOSPHOR SCREEN TO THE TUBE WALL.

LITTON IS USING THIS TYPE EQUIPMENT IN PRODUCTION OF IMAGE TUBES FOR AN/PVS-5, NIGHT VISION GOGGLE. SAVINGS IS ESTIMATED TO BE \$3.2 MILLIONS ON TUBES PRODUCED DURING THE 1976-81 TIME FRAME.



**5-PORT IMAGE TUBE
PROCESSOR**

DARCOM PRIOR YEAR MM&T IMPLEMENTATION QUALITY CONTROL TECHNIQUES



EFFORT NO: 2 75 9836

**TITLE: ESTABLISHMENT OF QC
TECHNIQUES FOR PDN OF
ETCHED CORE MICROCHANNEL
PLATES**

COST: \$276,000

BENEFITS

**THIS PROJECT DEVELOPED QUALITY
ASSURANCE POLICY AND PROCEDURES
FOR MANUFACTURE OF 18MM AND
25MM MICROCHANNEL PLATES.**

**VARIAN ASSOCIATES, PALO ALTO, CA,
ADOPTED THESE POLICIES AND
PROCEDURES IN PRODUCTION OF
MICROCHANNEL PLATES FOR IMAGE
INTENSIFIER TUBES. IN ADDITION TO
AN IMPROVEMENT IN PRODUCT
QUALITY, THE YIELD OF THE
PRODUCTION LINE HAS ALSO
INCREASED. ESTIMATED SAVINGS
FROM 1978-83 WILL BE \$2.45
MILLION.**

QUALITY ASSURANCE POLICY MANUAL

October 20, 1976



T. Meltzer, General Manager
Light Sensing Emitting Division
Varian Associates

Varian Associates 611 Hansen Way, Palo Alto, California 94303

DARCOM PRIOR YEAR MM&T IMPLEMENTATION JOINING ARMOR

EFFORT NO: T 7X 4329

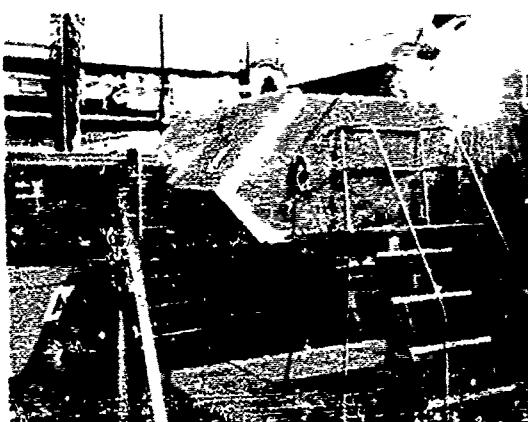
**TITLE: JOINING OF STEEL ARMOR-
INTERMIX**

COST: \$276,000

BENEFITS

**PROJECT DEVELOPED PRODUCTION
METHODOLOGY TO JOIN ARMORS OF
DIFFERENT TYPES AND HARDNESS.
THIS ALLOWS A MORE IMPACT
RESISTANT ARMOR TO BE APPLIED
TO AREAS PREVIOUSLY CONSIDERED
VULNERABLE.**

**THE ARMOR WELDING SPEC, MIL-
SPEC-W46086, WAS REVISED TO
INCLUDE THE PROCESSES DEVELOPED
IN THIS EFFORT. CHRYSLER IS USING
THIS SPEC AND THESE PROCESSES
FOR WELDING ARMOR ON THE XM1
TANK. THIS INCREASES THE BALLISTIC
PROTECTION OF THE TANK.**



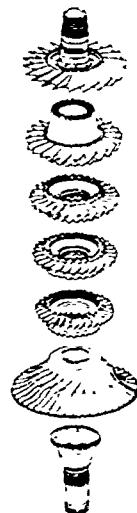
**MOCK TANK HULL
BEING WELDED**

DARCOM PRIOR YEAR MM&T IMPLEMENTATION TURBINE ENGINE COMPONENTS

EFFORT NO: 1 XX 7103

**TITLE: IMPROVED MANUFACTURE OF TURBINE
ENGINE COMPRESSOR COMPONENTS**

COST: \$740,000



BENEFITS

**THIS PROJECT DEVELOPED MACHINERY AND
PROCESSES FOR PRODUCTION OF TURBINE
ENGINE COMPRESSOR COMPONENTS THAT HAD
NEVER BEFORE BEEN MANUFACTURED.
APPLICATION WAS SHOWN ON THE BLISK
AND IMPELLER FOR THE T700 ENGINE.**

**IMPLEMENTATION
COST: \$14M**

**IMPLEMENTATION ON THE T700 PRODUCTION
LINE AT THE GENERAL ELECTRIC PLANT WILL
COST \$14 MILLION, BUT WILL SAVE \$16,000 PER
ENGINE OR \$60 MILLION AT THE SCHEDULED
PRODUCTION RATE.**

DARCOM PRIOR YEAR MM&T IMPLEMENTATION ROTOR BLADES

EFFORT NO: 1 77 7112

**TITLE: COMPOSITE IMPROVED MAIN
ROTOR BLADES**

COST: \$3,846,000



**COBRA HELICOPTER WITH
FILAMENT WOUND MAIN
ROTOR BLADE**

BENEFITS

**PROJECT DEVELOPED AND TESTED A
TDP FOR MASS PRODUCTION OF
FILAMENT-WOUND ROTOR BLADES.
IN ADDITION TO THE TDP, THE
PROJECT PROVIDED TOOLING FOR
FUTURE FABRICATION OF BLADES.**

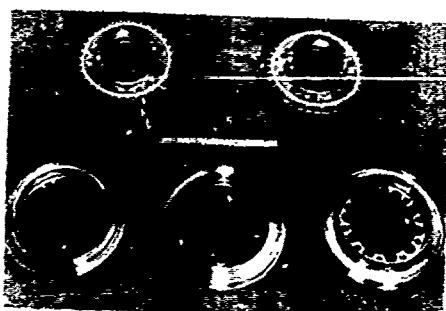
**KAMAN AEROSPACE CORP. IS
IMPLEMENTING THIS PROJECT
THROUGH THEIR CONTRACT TO
RETROFIT THE ENTIRE FLEET OF
COBRA HELICOPTERS WITH
COMPOSITE MAIN ROTOR BLADES.
BENEFITS ARE COMBAT ORIENTED
IMPROVEMENTS IN AIRCRAFT
PERFORMANCE, SURVIVABILITY,
MAINTAINABILITY, AND RELIABILITY.**

DARCOM PRIOR YEAR MM&T IMPLEMENTATION HOT ISOSTATIC PRESSING

EFFORT NO: 17X 8046

**TITLE: SMALL COOLED AXIAL TURBINE
BLADE, VANE AND DISK
FABRICATION**

COST: \$1,525,000



**T700 DISKS AND COOLING
PLATES MACHINED FROM
AS-HIP PREFORMS**

BENEFITS

**GENERAL ELECTRIC APPLIED HOT
ISOSTATIC PRESSING (HIP) TO FORM
TURBINE DISCS AND COOLING PLATES
THAT REQUIRED A MINIMUM OF
MACHINING.**

**HIPING ELIMINATES FORGING OF
TURBINE DISKS AND COOLING PLATES.**

**IT REDUCES SUPERALLOY POWDER
METAL QUANTITY BY 50 PERCENT.**

**THE AS-HIP RENE 95 PROCESS FOR
TURBINE DISKS AND COOLING PLATES
IS IN FULL PRODUCTION AT GENERAL
ELECTRIC.**

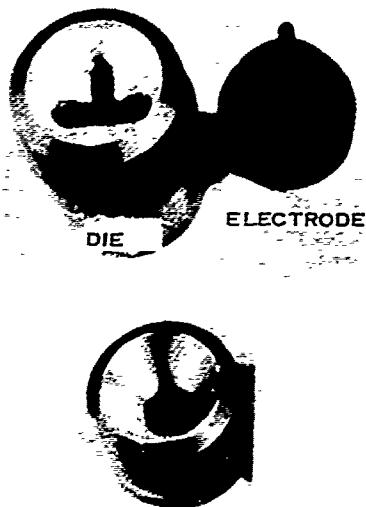
**BASED ON CURRENT SAVINGS FROM
USING THE PROCESS, GE ANTICIPATES
AN AVERAGE SAVING OF APPROXIMATELY
\$2 MILLIONS PER YEAR ON THE CURRENT
T700 PRODUCTION ORDER.**

DARCOM PRIOR YEAR MM&T IMPLEMENTATION EXTRUSION DIES

EFFORT NO: 175 8154

**TITLE: CADCAM OF EXTRUSION DIES FOR
ALUMINUM, TI, AND STEEL PARTS**

COST: \$182,000



EXTRUSION DIE

BENEFITS

**DEVELOPED AN INTERACTIVE SYSTEM OF
COMPUTER PROGRAMS FOR DESIGN AND MFG
OF EXTRUSION DIES. UTILIZATION OF THIS
SYSTEM PROVIDES FASTER DESIGN & MFG OF
DIES, IMPROVED DIE TOLERANCES, AND
IMPROVED YIELD VIA OPTIMUM EXTRUSION
VARIABLES.**

**THE AIR FORCE MATERIALS LAB IS USING THE
SYSTEM TO DESIGN AND GENERATE NC TAPES
FOR ALL THEIR AL EXTRUSION DIES. THEY
REPORT A \$10K PER YEAR SAVINGS. BECAUSE
COPIES OF THE PROGRAMS WERE FURNISHED
NUMEROUS CONTRACTORS, OTHER IMPLEMEN-
TATION IS HIGHLY POSSIBLE BUT DIFFICULT
TO TRACK.**

DARCOM PRIOR YEAR MM&T IMPLEMENTATION

EFFORT NO: 3 75 3157

TITLE: PDN TECH FOR DIODE PHASE
SHIFTER ELEMENTS

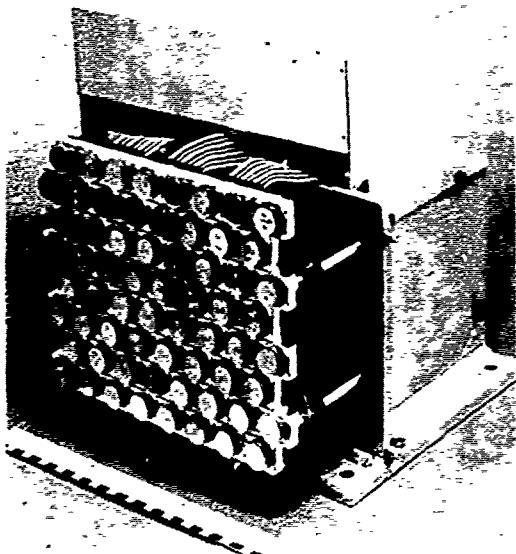
COST: \$650,000

BENEFITS

PROJECT DEVELOPED A HIGH RATE PRODUCTION METHOD FOR MANUFACTURING DIODE PHASE SHIFTER-RADIATOR ELEMENTS BY A THICK FILM PROCESS IN LIEU OF A THIN FILM PROCESS. IT ALSO INCORPORATED A DUAL INTEGRATED ELEMENT MODULE CONCEPT.

THE MM&T CONTRACTOR, HUGHES AIRCRAFT, TRANSFERRED THE TECHNOLOGY TO THEIR NEWPORT BEACH, CA DIVISION WHERE THE METHOD IS BEING USED IN PRODUCTION OF THE AN/TPQ37 FIRE FINDER RADAR. HUGHES ESTIMATES A \$10,241K SAVINGS DURING THE 1978-82 TIMEFRAME. OTHER BENEFITS INCLUDE REDUCED WEIGHT AND INCREASED RELIABILITY.

IMPLEMENTATION COST: \$200K



64 ELEMENT INTEGRATED SUBARRAY MODULE

DARCOM PRIOR YEAR MM&T IMPLEMENTATION ROCKET MOTOR PROPELLANTS

EFFORT NO: R 7X 3170

**TITLE: REPLACEMENT OF TPH-8156
AND TPH-8159 PROPELLANT**

COST: \$375,000

BENEFITS

**IN 1974, COMMERCIAL SOURCES
STOPPED PRODUCING TWO CURING
AGENTS USED IN PROPELLANT FOR
THE PERSHING ROCKET MOTORS.
THIS PROJECT DETERMINED MIXING
PROCEDURES FOR MANUFACTURING
OF THE PROPELLANTS USING
ALTERNATE CURING AGENTS.**

**LONGHORN AAP IS USING THE
DEVELOPED PROCEDURES TO
MANUFACTURE THE NEW
PROPELLANTS FOR THE PERSHING
MISSILE ALTHOUGH THE NEW
PROPELLANTS EXHIBIT IMPROVED
PERFORMANCE AND RELIABILITY,
THE PRIMARY BENEFIT IS THE
ABILITY TO PRODUCE A
PROPELLANT FOR THE PERSHING.**



PERSHING MISSILES

DARCOM PRIOR YEAR MM&T IMPLEMENTATION COMPUTERIZED PROCESS PLANNING

EFFORT NO: 37X3232

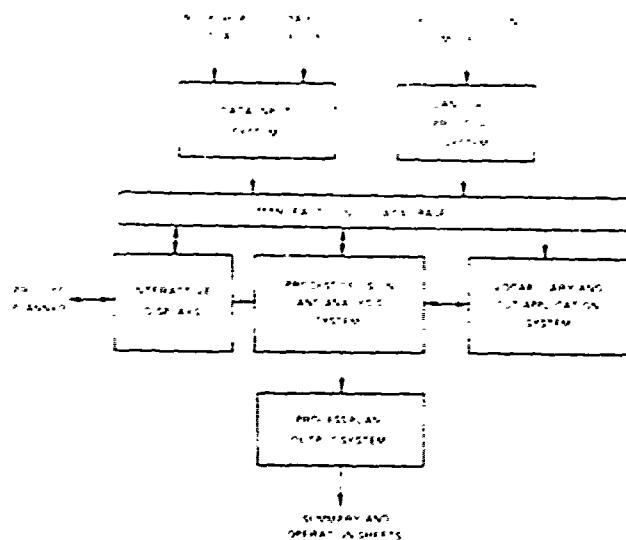
**TITLE: COMPUTERIZED PRODUCTION
PROCESS PLANNING**

COST: \$345,000

BENEFITS

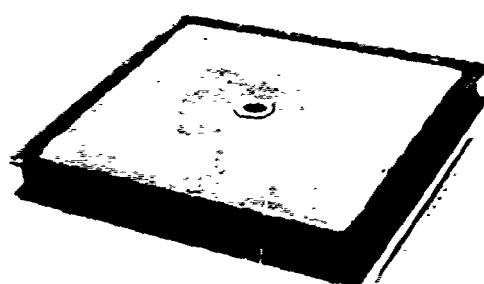
PROJECT DEVELOPED A COMPUTERIZED PRODUCTION PROCESS PLANNING SYSTEM (CPPP) TO ASSIST PROCESS PLANNERS IN PLANNING THE FABRICATION OF CYLINDRICAL PARTS.

THE CPPP SYSTEM IS BEING USED BY HAMILTON STANDARD, PRATT & WHITNEY AND SIKORSKY, WHICH ARE ALL SUBSIDIARIES OF UNITED TECHNOLOGIES. APPROXIMATELY 50% OF THESE COMPANIES WORK-LOAD IS FOR GOVERNMENT AGENCIES. HAMILTON STD ESTIMATES A 39% REDUCTION IN PROCESS PLANNING MANHOURS. OTHER BENEFITS INCLUDE PROCESS STANDARDIZATION AND MACHINE OPTIMIZATION.

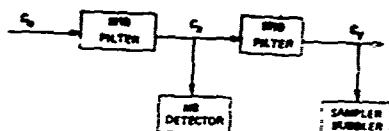


CPPP SOFTWARE COMPONENTS

DARCOM PRIOR YEAR MM&T IMPLEMENTATION TOXIC HAZARDS



M10 GAS FILTER



**DUAL FILTER SYSTEM
SCHEMATIC**

EFFORT NO: 5 7X 1248

**TITLE: EVALUATION OF EXHAUST
FILTER SYSTEM**

COST: \$444,000

BENEFITS

THIS PROJECT EVALUATED SIX GAS FILTERS AND FOUND THEM SUITABLE FOR USE IN REDUCING TOXIC HAZARDS. THE PROJECT ALSO DETERMINED THAT A DUAL FILTER SYSTEM WITH AN AGENT DETECTOR BETWEEN THE FILTERS CAN INSURE THAT STACK EMISSIONS DO NOT EXCEED EPA REGULATIONS.

THE DUAL FILTER CONCEPT HAS BEEN INSTALLED AT THE CHEMICAL AGENT MUNITIONS DISPOSAL SYSTEM AT TOOKEE ARMY DEPOT AND SEVERAL SMALL SCALE DEMIL OPERATIONS THROUGHOUT THE COUNTRY.

DARCOM PRIOR YEAR MM&T IMPLEMENTATION GRENADE FILLING

EFFORT NO: 5 7X 1260

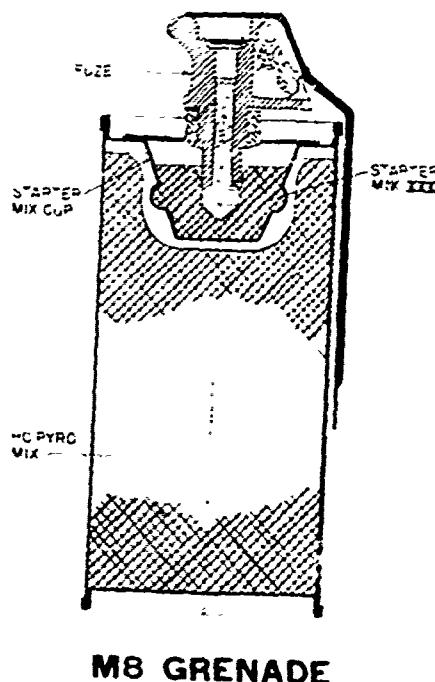
**TITLE: AUTOMATED FORMING AND FILLING
OF STARTER CUP FOR M8 GRENADE**

COST: \$105,000

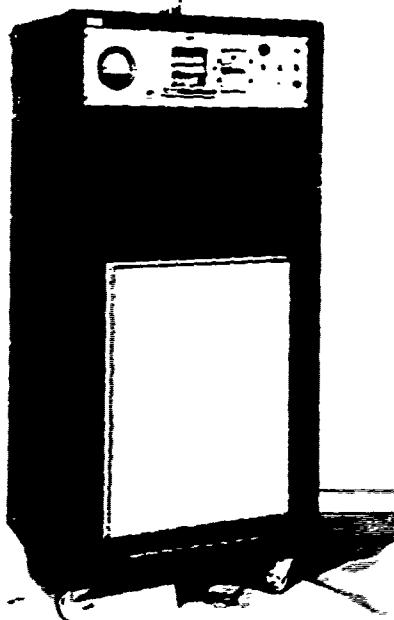
BENEFITS

**THIS EFFORT EVALUATED THE PRODUCTION
OF A PREFORMED M8 GRENADE STARTER
SLUG USING A TABLETING PRESS. THIS
METHOD IS CURRENTLY BEING USED AT
PINE BLUFF ARSENAL IN THE PRODUCTION
OF M8 GRENADE STARTER MIX SLUGS. IT
IS ALSO BEING UTILIZED TO MANUFACTURE
STARTER MIX SLUGS FOR THE 105MM AND
155MM SMOKE CANISTERS.**

**THE BENEFIT IS AN IMPROVED PROCESS
WHICH REDUCES MANPOWER BY 47% AND
REDUCES COST OF THE END ITEM BY
\$0.056 PER GRENADE. THE PROCESS ALSO
IMPROVES SAFETY BY GREATLY REDUCING
THE NUMBER OF PERSONNEL IN DIRECT
CONTACT WITH A PYROTECHNIC MIX.**



DARCOM PRIOR YEAR MM&T IMPLEMENTATION CONTAMINANT MONITORS



REAL TIME MONITOR

EFFORT NO: 5 7X 1277

**TITLE: HIGHLY SENSITIVE AND FAST
RESPONSE CONTAMINANT
MONITORS**

COST: \$1,686,000

BENEFITS

**THIS PROJECT DEVELOPED A REAL TIME
MONITOR ALARM FOR NERVE AGENTS
AND MODIFIED A COMMERCIAL SULFUR
ANALYZER TO MONITOR THE EMISSIONS
DURING THE DEMIL OF MUSTARD AGENT.**

**THESE MONITORS WERE INSTALLED IN
THE CHEMICAL DEMIL FACILITY AT
TOOELE ARMY DEPOT. THE MONITORS
PROVIDE IMPROVED SAFETY FOR PLANT
OPERATORS AND ASSIST PLANT
OPERATORS IN LOCATING FAILURES
OR MALFUNCTIONS.**

DARCOM PRIOR YEAR MM&T IMPLEMENTATION FUZE ASSEMBLY AND INSPECTION

EFFORT NO: 5 TX 4032

**TITLE: AUTOMATED EQUIP FOR ASSEMBLY
OF M739 FUZE**

COST: \$1,365,000

BENEFITS



PROJECT DEVELOPED A PROTOTYPE PRODUCTION LINE FOR AUTOMATED ASSEMBLY AND INSPECTION OF THE M739 FUZE.

THE PROTOTYPE PRODUCTION LINE WAS SUPPLEMENTED BY EQUIPMENT PURCHASED UNDER A FACILITIES PROJECT. THIS PRODUCTION LINE WAS PUT INTO USE AT HONEYWELL AND HAS PRODUCED OVER 2 MILLION M739 FUZES WITH A MINIMUM OF DEPENDENCE ON HUMAN JUDGEMENT AND SKILLED OPERATORS.

DARCOM PRIOR YEAR MM&T IMPLEMENTATION WASTE INCINERATION

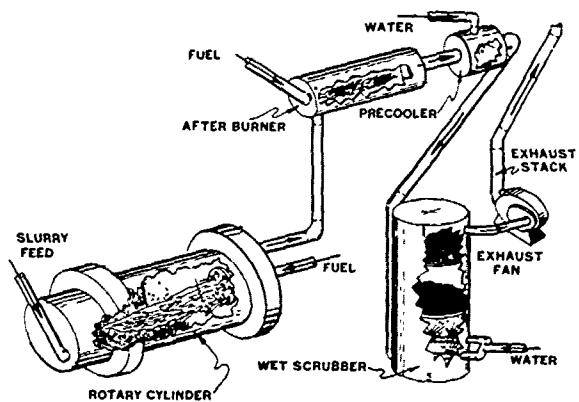
EFFORT NO: 5 XX 4114/PO6

**TITLE: PROPELLANT & EXPLOSIVE
WASTE INCINERATION**

COST: \$2,450K

BENEFITS

THIS TASK DEVELOPED TWO ACCEPTABLE P&E INCINERATORS (ROTARY KILN & FLUIDIZED BED) TO REPLACE OPEN AIR BURNING. A ROTARY KILN IS INSTALLED AND OPERATING AT RADFORD AAP. INCINERATORS OF BOTH TYPES ARE SCHEDULED FOR INSTALLATION AT NUMEROUS AMMO PLANTS AND DEMIL FACILITIES.



ROTARY KILN SCHEMATIC

UTILIZATION OF THESE INCINERATORS HAS/WILL PROVIDE A SAFE METHOD FOR DISPOSAL OF P&E WASTE WITH A SIGNIFICANT REDUCTION IN POLLUTANTS.

DARCOM PRIOR YEAR MM&T IMPLEMENTATION DETINATION TRAPS

EFFORT NO: 5 7X 4134

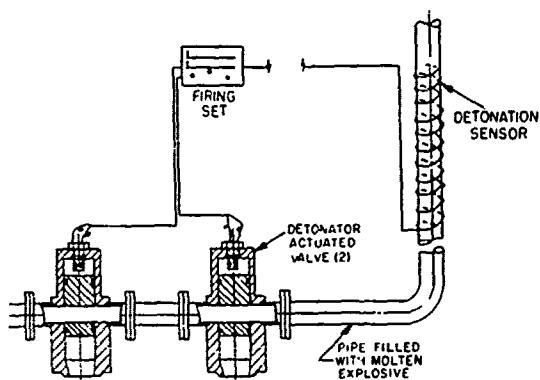
**TITLE: DETONATION TRAPS FOR
IMPROVED SAFETY IN
MUNITIONS PLANTS**

COST: \$623,000

BENEFITS

THIS PROJECT DEVELOPED DETONATION TRAPS WHICH CAN BE INSTALLED IN PIPELINES TO STOP PROPAGATION OF EXPLOSIVE DETONATIONS.

THESE TRAPS WERE INSTALLED IN THE ARRADCOM MELT-POUR PILOT PLANT BETWEEN THE MELT BUILDING AND THE LOADING BUILDING. IN THE EVENT OF AN EXPLOSION, THESE TRAPS WILL MINIMIZE THE LOSSES BY PREVENTING PROPAGATION FROM ONE BUILDING TO ANOTHER THROUGH THE PIPELINES.



DETINATION TRAP CONCEPT

DARCOM PRIOR YEAR MM&T IMPLEMENTATION EXPLOSIVE RECOVERY

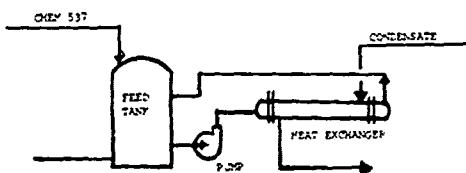
EFFORT NO: 5 74 4205

**TITLE: PROCESSING SPENT ACID FROM
RDX/HMX REACTION FOR
RECOVERY OF EXPLOSIVES**

COST: \$70,000

BENEFITS

THIS PROJECT INSTALLED A HEATING AND CIRCULATING LOOP ONTO THE PRIMARY EVAPORATOR FEED TANK IN THE SPENT ACID RECOVERY PROCESS AT HOLSTON AAP.



**PRIMARY EVAPORATOR
FEED TANK**

THIS HEAT EXCHANGER INCREASED THE SOLUBILITY OF RDX/HMX IN THE SPENT ACID, THUS DECREASING THE EXPLOSIVE LOAD LIMIT OF THE LINE. ADDED BENEFITS INCLUDE \$11,000/YEAR STEAM COST SAVINGS FROM RECOVERING CONDENSATE. ALSO, THE HOT FEED PREVENTS BUILDUP OF CRYSTALLIZED RDX ON PIPE WALLS.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT ARTILLERY SHELL BANDING

EFFORT NO: 5 73 6522

IMPLEMENTATION	TITLE: COMPUTER MONITOR OF ARTILLERY SHELL BAND WELDING BY CLOSED LOOP TECHNIQUES
LOCATION SCRANTON APP CHAMBERLAIN MFG New Bedford, MA Waterloo, IA NORRIS INDUSTRIES LOUISIANNA AAP	ITEMS SUPPORTED M509 M483 M329 M483, M509, M549 M483

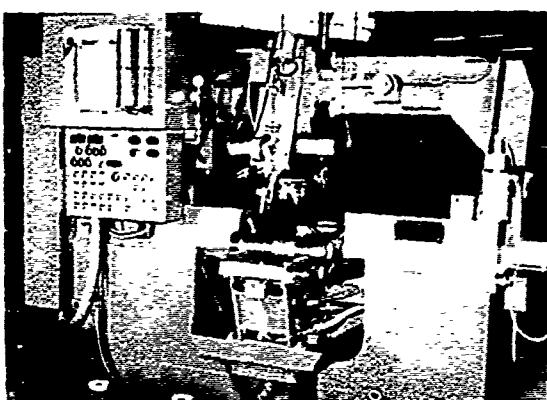
COST: \$358,000

BENEFITS

PROJECT ADAPTED A MINICOMPUTER AND VARIOUS SENSING DEVICES TO WELDING EQUIPMENT FOR DEPOSITING NONFERROUS OVERLAYS.

THIS EQUIPMENT PLUS FUTURE GENERATIONS OF THIS EQUIPMENT HAS BEEN USED AT VARIOUS METAL PARTS FACILITIES. BENEFITS ARE AS FOLLOWS:

- **REQUIRES LESS SKILLED OPERATORS**
- **50% INCREASE IN YIELD OVER PRIOR METHODS**
- **REDUCED REJECT RATE FROM 11% TO 2%**



NEW WELDING EQUIPMENT

DARCOM PRIOR YEAR MM&T IMPLEMENTATION SHOP DATA COLLECTION

EFFORT NO: 6 7X 7248

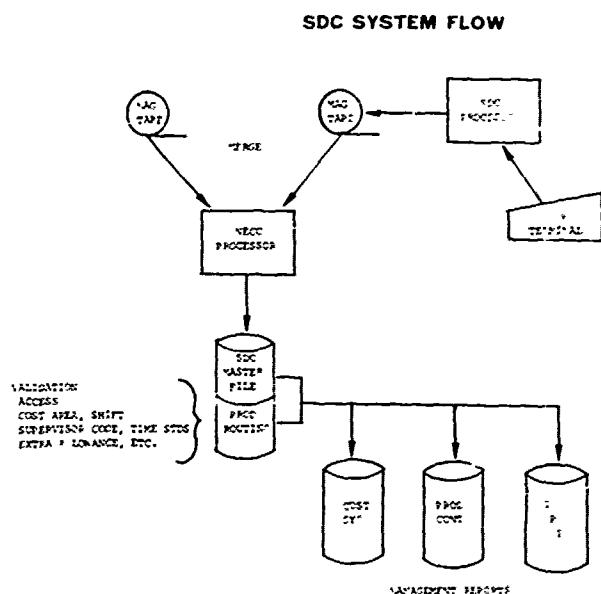
TITLE: IMPROVED MFG CONTROL
THROUGH DATA AUTOMATION

COST: \$396,000

BENEFITS

THIS PROJECT DEVELOPED, INSTALLED, AND IMPLEMENTED AN AUTOMATED SHOP DATA COLLECTION (SDC) SYSTEM AT WATERVLIET ARSENAL. ALL PRODUCTION REPORTING BY SHOP LABOR IS ACCOMPLISHED THROUGH THIS SYSTEM. IN ADDITION, THE PROJECT DEVELOPED A WORKLOAD FORECASTING SYSTEM AND ESTABLISHED A COMMON COMPUTER DATA BASE FOR BILL OF MATERIALS AND PRODUCTION ROUTING.

USING THIS SYSTEM HAS INCREASED PRODUCTIVITY BY PROVIDING MORE ACCURATE AND TIMELY REPORTS TO SHOP MANAGERS. IN ADDITION, HARD SAVINGS WERE OBTAINED FROM THE ELIMINATION OF TIME CLERKS AND KEYPUNCH REQUIREMENTS. SAVINGS ESTIMATED AT \$176K PER YEAR.



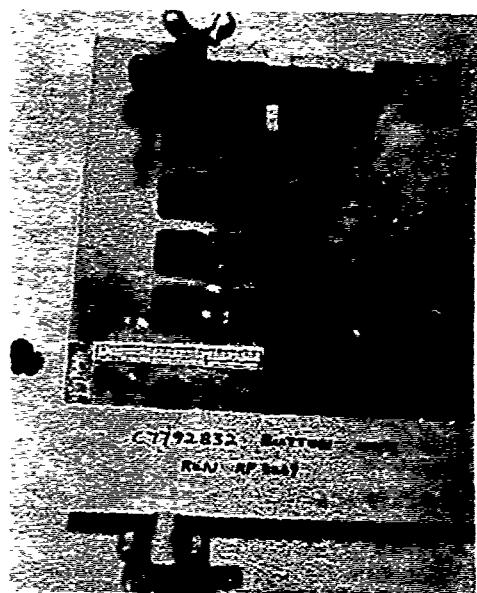
DARCOM PRIOR YEAR MM&T IMPLEMENTATION

EPOXY RESIN MOLDS

EFFORT NO: 6 73 7305

**TITLE: RESIN BONDED MOLD & DIE
PRODUCTION TECHNOLOGY**

COST: \$35,000



**EPOXY MOLD, INVESTMENT
WAX PATTERN AND CAST
COMPONENT FOR BUTTON
(M219)**

BENEFITS

**THIS PROJECT INVESTIGATED THE
TECHNOLOGY REQUIRED TO
PRODUCE EPOXY RESIN MOLDS FOR
SHORT PRODUCTION RUNS OF (1)
WAX INVESTMENT PATTERNS,
(2) PLASTIC PARTS, AND (3) RUBBER
PARTS.**

**RESIN BONDED MOLDS FOR
PRODUCING SMALL INVESTMENT
CASTING WAX MOLDS WAS
INTRODUCED AT ROCK ISLAND
ARSENAL AN AVERAGE SAVINGS OF
\$21,000 PER YEAR HAS ACCRUED
FROM USING THIS PROCESS.**

DARCOM PRIOR YEAR MM&T IMPLEMENTATION HORIZONTAL QUENCHING

EFFORT NO: 6 74 7481

**TITLE: HORIZONTAL SPRAY QUENCHING
FOR HEAT TREATMENT OF
CANNON TUBES**

COST: \$100,000

BENEFITS

THIS PROJECT DEVELOPED A HORIZONTAL SPRAY METHOD FOR QUENCHING CANNON TUBES. THIS ELIMINATED THE REQUIREMENT FOR LARGE VERTICLE QUENCH TANKS WHICH COULD ONLY BE CONSTRUCTED WITH DEEP PITS OR HIGH BAYS.

A PRODUCTION SIZE HORIZONTAL SPRAY QUENCHING SYSTEM WAS PURCHASED UNDER A MODERNIZATION EFFORT AT WATERVLIET ARSENAL. THIS EQUIPMENT INCREASES GUN TUBE QUALITY BY REDUCING THE VARIABILITY OF YIELD STRENGTH IN THE TUBE. THE SYSTEM SAVES OVER \$1.3M PER YEAR DUE TO INCREASED PRODUCTIVITY IN THE HEAT TREAT CYCLE.



**HORIZONTAL QUENCHING
SYSTEM**

DARCOM PRIOR YEAR MM&T IMPLEMENTATION AUTOMATIC DRAFTING

EFFORT NO: 6 74 7484

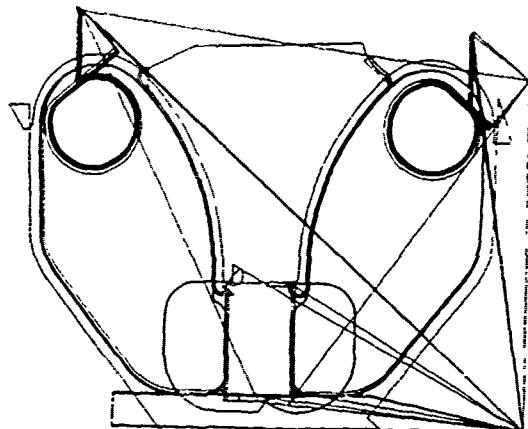
**TITLE: APPLICATION OF
AUTOMATIC DRAFTING MACHINE**

COST: \$100,000

BENEFITS

**THIS PROJECT EXPANDED THE
CAPABILITIES OF A PREVIOUSLY
PURCHASED AUTOMATIC DRAFTING
MACHINE.**

**THE PRIMARY BENEFIT WAS THE
ABILITY TO VERIFY AND CORRECT
N/C TAPES BY SIMULATION ON
THE DRAFTING MACHINE RATHER
THAN USING THE ACTUAL N/C
MACHINE. THE SIMULATION IS A
CONSIDERABLY FASTER AND LESS
EXPENSIVE METHOD. REDUCTIONS
IN ENGINEERING DESIGN,
PROGRAMMING, DIRECT LABOR,
AND N/C MACHINE TIME HAVE
BEEN EXPERIENCED.**



**N/C VERIFICATION - CENTERLINE
OF CUTTING TOOL PATH.**

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